PHASE **2**

Washington State
School Seismic Safety Assessments Project

HOQUIAM FIRE DEPARTMENT 8TH STREET STATION

City of Hoquiam

SEISMIC UPGRADES CONCEPT DESIGN REPORT

June 2021

PREPARED FOR

PREPARED BY

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WASHINGTON STATE SCHOOL SEISMIC SAFETY ASSESSMENTS PROJECT

SEISMIC UPGRADES CONCEPT DESIGN REPORT

Hoquiam Fire Department – 8Th Street Station

City of Hoquiam

June 2021

Prepared for:

State of Washington
Department of Natural Resources

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EXECUTIVE SUMMARY

This report documents the findings of a seismic evaluation of the 8th Street Hoquiam Fire Station building in Hoquiam, Washington. This building is the main fire department facility that serves Hoquiam. The building has four apparatus bays and can house multiple fire trucks. It also has a hose tower, sleeping quarters, administrative offices, and kitchen. The Hoquiam Fire Station building has a somewhat rectangular footprint, with two projections at the west side, with an approximate total area of 12,900 square feet. The building has a large four-bay apparatus bay to the northeast side and an administrative/living-quarter area to the southwest. Both areas are two stories, although the apparatus bay area is a high-bay structure. The walls are generally concrete masonry unit (CMU), with a few wood stud-walls at the second level. The roof and floor above the garage bays are flexible wood diaphragms. There is an 8-inch-thick concrete elevated slab at the second floor, over the administrative side of the building. The lateral system is comprised of CMU shear walls, a rigid second floor diaphragm at the administrative area, and flexible wood diaphragms at the roof.

WSP USA, Inc. performed a Tier 1 screening in accordance with the ASCE 41-17 standard *Seismic Evaluation and Retrofit of Existing Buildings*. The evaluation included field observations and review of record drawings to verify the existing construction. The structural seismic evaluation indicated that the building has multiple seismic deficiencies; the most susceptible ones generally pertain to the roof diaphragm: lack of wall anchorage, geometric irregularity at the hose tower, lack of tension capacity at reentrant corners of the roof diaphragm, straight sheathing, and roof diaphragm spans exceeding acceptable limits.

Conceptual seismic upgrade recommendations for the structural systems are provided to improve the performance of the building to meet the Immediate Occupancy structural performance objective criteria of ASCE 41-17. Sketches for the concept-level seismic upgrades are provided in Appendix B. The structural upgrades include installing new plywood roof sheathing, adding bracing to the CMU walls at regular spacing, adding out-of-plane connections from the roof diaphragm at the hose tower, and adding steel coil straps at the top of the roof diaphragm at reentrant corners. The recommendations for nonstructural upgrades are to anchor or brace tall and narrow contents with a height more than 6 feet and a height-to-depth or -width ratio greater than 3-to-1. Equipment, stored items, or other contents weighing more than 20 pounds whose center of mass is more than 4 feet above the adjacent floor should also be anchored or braced to structure.

An opinion of probable construction costs is provided in Appendix C. It is our opinion that the total cost (construction costs plus soft costs) to upgrade the structure would range between $1.28M and $2.39M with the baseline probable total cost being $1.60M.

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Acronyms

AACE	Association for the Advancement of Cost Engineering
ADA	Americans with Disabilities Act
ASCE	American Society of Civil Engineers
A-E	Architects-Engineers
BPOE	Basic Performance Objective for Existing Buildings
BSE	Basic Safety Earthquake
CMU	Concrete Masonry Unit
CP	Collapse Prevention
DNR	Department of Natural Resources
DCR	Demand-to-Capacity Ratio
EERI	Earthquake Engineering Research Institute
EPAT	EERI Earthquake Performance Assessment Tool
FEMA	Federal Emergency Management Agency
GC/CM	General Contractor / Construction Manager
GWB	Gypsum Wallboard
IBC	International Building Code
ICOS	Information and Condition of Schools
IEBC	International Existing Building Code
IO	Immediate Occupancy
LS	Life Safety
MCE	Maximum Considered Earthquake
MEP	Mechanical/Electrical/Plumbing
NFPA	National Fire Protection Association
OSHA	Occupational Safety and Health Administration
OSPI	Office of Superintendent of Public Instruction
PBEE	Performance-Based Earthquake Engineering
PR	Position Retention
ROM	Rough Order-of-Magnitude
SSSSC	School Seismic Safety Steering Committee
UBC	Uniform Building Code
URM	Unreinforced Masonry
USGS	United States Geological Survey
WF	Wide Flange
WGS	Washington Geological Survey
WSSSSAP	Washington State School Seismic Safety Assessments Project

Reference List

Codes and References

2018 IBC, *2018 International Building Code,* prepared by the International Code Council, Washington, D.C.

AACE International Recommended Practice No. 56R-08, 2020, *Cost Estimate Classification System*, prepared by the Association for the Advancement of Cost Engineering International, Fairmont, West Virginia.

ASCE 7-16, 2017, *Minimum Design Loads for Buildings and Other Structures*, prepared by the Structural Engineering Institute of the American Society of Civil Engineers, Reston, Virginia.

ASCE 41-17, 2017, *Seismic Evaluation and Retrofit of Existing Buildings*, prepared by the Structural Engineering Institute of the American Society of Civil Engineers, Reston, Virginia.

FEMA E-74, 2011, *Reducing the Risks of Nonstructural Earthquake Damage: A Practical Guide*, prepared by Applied Technology Council, Redwood City, California.

Structural Engineers of Northern California, 2017, Earthquake Performance Rating System ASCE 41-13 Translation Procedure: The Buildings Ratings Committee, a sub-committee of the Existing Buildings Committee of The Structural Engineers Association of Northern California.

Structural Engineers of Northern California, 2015, Earthquake Performance Rating System User's Guide: The Buildings Ratings Committee, a sub-committee of the Existing Buildings Committee of The Structural Engineers Association of Northern California.

Drawings

Street & Lundgren Architects and Consultants, August 5, 1970, existing drawings titled "Hoquiam Central Fire Station, Eighth Street at M, Hoquiam, Washington" Aberdeen, Washington

1.0 Introduction

1.1 Background

In 2018-2019, the Washington Geological Survey (WGS), a division of the Department of Natural Resources (DNR), led a Washington State School Seismic Safety Assessments Project (WSSSSAP) that seismically and geologically screened 222 school buildings and 5 fire stations across Washington State to better understand the current level of seismic risk of Washington State's public-school buildings. This first phase of the WSSSSAP was executed with the help of Washington State's Office of Superintendent of Public Instruction (OSPI) and Reid Middleton, along with their team of structural engineers, architects, and cost estimators.

Building upon the success of Phase 1, WGS, OSPI, and Reid Middleton's team embarked on Phase 2 of this project to seismically and geologically screen another 339 school buildings and 2 fire stations, mostly located in the high-seismic risk regions of Washington State. Similar to Phase 1, the two main components of Phase 2 of this seismic safety assessments project are: (1) geologic site characterization, and (2) the seismic assessment of buildings. As a part of the seismic assessments, Tier 1 screening of structural systems and nonstructural assessments were performed in accordance with the American Society of Civil Engineers' (ASCE) Standard 41-17 *Seismic Evaluation and Retrofit of Existing Buildings*. Concept-level seismic upgrades were developed to address the identified deficiencies of a select number of school buildings to evaluate seismic upgrade strategies, feasibilities, and implementation costs.

As part of this statewide study, two fire stations were selected in consultation with WGS and the Washington State Emergency Management Division to receive concept-level seismic upgrade designs utilizing the ASCE 41 Tier 1 evaluation results. This report documents the concept-level seismic upgrade design for one of those two fire station buildings. The concept-level seismic upgrades will include structural and nonstructural seismic upgrade recommendations, with concept-level sketches and rough order-of-magnitude (ROM) construction costs determined for each building.

The seismic evaluation consists of a Tier 1 screening for the structural systems performed in accordance with ASCE 41-17.

1.2 Scope of Services

The project is being performed in several distinct and overlapping phases of work. The scope of this report is as listed in the following sections.

1.2.1 Information Review

1. <u>Project Research</u>: Reid Middleton and their project team researched available building records, such as relevant site data and record drawings, in advance of the field investigations. This research included searching city records and contacting the fire

departments to obtain building plans, seismic reports, condition reports, or related construction information useful for the project.

2. Site Geologic Data: Site geological data provided by the WGS, including site shear wave velocities, was utilized to determine the project Site Class in accordance with ASCE 41, which is included in the Tier 1 checklists and concept-level seismic upgrades design work.

1.2.2 Field Investigations

1. Field Investigations: Each of the identified buildings was visited to observe the building's age, condition, configuration, and structural systems for the purposes of the ASCE 41 Tier 1 seismic evaluations. This task included confirmation of general information in building records or layout drawings and visual observation of the structural condition of the facilities. Engineer field reports, notes, photographs, and videos of the facilities were prepared and utilized to record and document information gathered in the field investigation work.

2. Limitations Due to Access: Field observation efforts were limited to areas and building elements that were readily observable and safely accessible. Observations requiring access to confined spaces, potential hazardous material exposure, access by unsecured ladder, work around energized equipment or mechanical hazards, access to areas requiring Occupational Safety and Health Administration (OSHA) fall-protection, steep or unstable slopes, deteriorated structural assemblies, or other conditions deemed potentially unsafe by the engineer were not performed. Removal of finishes (e.g., gypsum board, lath and plaster, brick veneer, roofing materials) for access to concealed conditions or to expose elements that could not otherwise be visually observed and assessed was not performed. Material testing or sampling was not performed. The ASCE 41 checklist items that were not documented due to access limitations are noted.

1.2.3 Seismic Evaluations and Conceptual Upgrades Design

1. Seismic Evaluations: Limited seismic evaluations of the structural and nonstructural systems of the school buildings and fire stations were performed using ASCE 41-17 Tier 1 Evaluation procedures and checklists.

2. Conceptual Upgrades Design: Further seismic evaluation work was performed to provide conceptual seismic retrofits and/or upgrade designs for the selected school buildings and fire stations based on the results of the Tier 1 seismic evaluations. The conceptual seismic upgrades design work includes narrative descriptions of proposed seismic retrofits and/or upgrade schemes and concept sketches depicting the extent and type of recommended structural upgrades.

3. Architectural Review: The seismic upgrade concept developed by the structural engineers was reviewed by Rolluda Architects, Inc., for general guidance and consideration of the architectural aspects of the seismic upgrade. The architects discussed the seismic

upgrade concepts with the structural engineer and reviewed existing drawings that were available, pictures taken during the engineer's field investigations, and the ASCE 41 Tier 1 Screening reports. However, field visits by the architect and meetings with the fire departments and facilities personnel to discuss phasing and programming requirements were not included in the project scope of work. The architectural considerations are discussed in Section 4.4 Nonstructural Recommendations and Considerations. These conceptual designs were reviewed with high-level recommendations. Future planning for seismic improvements should include further review with a design team.

4. Cost Estimating: Through the concept-level seismic upgrades design process, ProDims, LLC, provided opinions of probable construction costs for the conceptual seismic upgrade designs for the selected fire station building. This conceptual seismic upgrade design and the associated opinions of probable construction cost is intended to be one of many cost data points still needed to estimate the overall capital needs of seismically upgrading fire stations in the high seismic hazard areas of Washington State.

1.2.4 Reporting and Documentation

1. Conceptual Upgrade Design Reports: Buildings that were selected to receive a conceptual upgrade design will have a report prepared that will include an introduction summarizing the overall findings and recommendations, along with individual sections documenting each building's seismic evaluation, list of deficiencies, conceptual seismic upgrade sketches and opinions of probable construction costs.

2. Building Photography: Photos were taken of each building during on-site walkthroughs to document the existing building configurations, conditions, and structural systems. These are available upon request through DNR/WGS.

3. Existing Drawings: Select and available existing drawings and other information were collected during the evaluation process. These are available upon request through DNR/WGS.

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2.0 Seismic Evaluation Procedures and Criteria

2.1 ASCE 41 Seismic Evaluation and Retrofit Overview

The current standard for seismic evaluation and retrofit (upgrades) of existing buildings is ASCE 41-17. ASCE 41 provides screening and evaluation procedures used to identify potential seismic deficiencies that may require further investigation or hazard mitigation. It presents a three-tiered review process, implemented by first following a series of predefined checklists and "quick check" structural calculations. Each successive tier is designed to perform an increasingly refined evaluation procedure for seismic deficiencies identified in previous tiers in the process. The flow chart in Figure 2.1 illustrates the evaluation process.

TIER 1 – Screening Phase
- Checklists of evaluation statements to quickly identify potential deficiencies
- Requires field investigation and/or review of record drawings
- Analysis limited to "Quick Checks" of global elements
- May proceed to Tier 2, Tier 3, or rehabilitation design if deficiencies are identified

TIER 2 – Evaluation Phase
- "Full Building" or "Deficiency Only" evaluation
- Address all Tier 1 seismic deficiencies
- Analysis more refined than Tier 1, but limited to simplified linear procedures
- Identify buildings not requiring rehabilitation

TIER 3 – Detailed Evaluation Phase
- Component-based evaluation of entire building using reduced ASCE 41 forces
- Advanced analytical procedures available if Tier 1 and/or Tier 2 evaluations are judged to be overly conservative
- Complex analysis procedures may result in construction savings equal to many times their cost

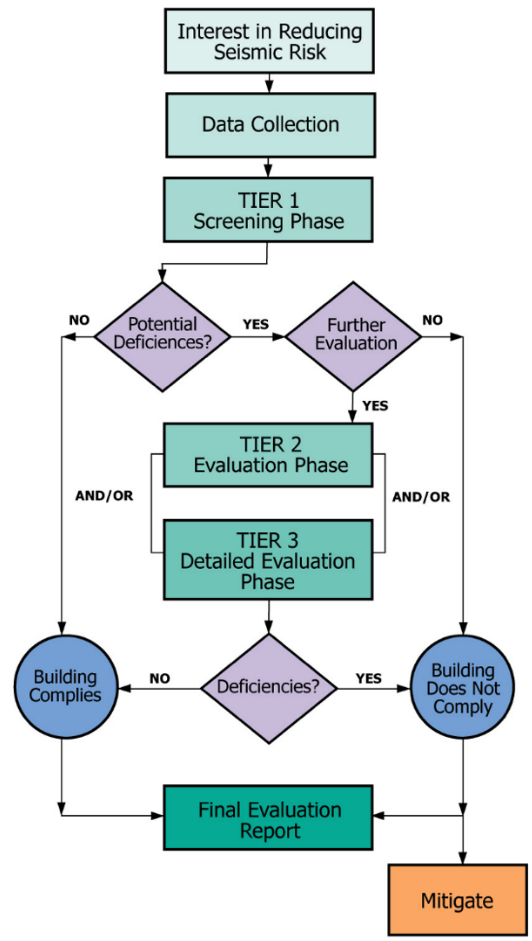

Figure 2-1. Flow Chart and Description of ASCE 41 Seismic Evaluation Procedure.

The Tier 1 checklists in ASCE 41 are specific to each common building type and contain seismic evaluation statements based on observed structural damage in past earthquakes. These checklists screen for potential seismic deficiencies by examining the lateral-force-resisting systems and details of construction that have historically caused poor seismic performance in similar buildings. Tier 1 screenings include basic "Quick Check" analyses for primary components of the lateral system. Tier 1 screenings also include prescriptive checks for proper seismic detailing of connections, diaphragm spans and continuity, and overall system configuration.

Tier 2 evaluations then follow with more-detailed structural and seismic calculations and assessments to either confirm the potential deficiencies identified in the Tier 1 review or demonstrate their adequacy. A Tier 3 evaluation involves an even more detailed analysis and advanced structural and seismic computations to review each structural component's seismic demand and capacity. A Tier 3 evaluation is similar in scope and complexity to the types of analyses often required to design a new building in accordance with the International Building Code (IBC), with a comprehensive analysis aimed at evaluating each component's seismic performance. Generally, Tier 3 evaluations are not practical for typical and regular-type buildings due to the rigorous and complicated calculations and procedures. As indicated in the Scope of Services, this evaluation included a Tier 1 screening of the structural systems.

2.2 Seismic Evaluation and Retrofit Criteria

Performance-Based Earthquake Engineering (PBEE) can be defined as the engineering of a structure to resist different levels of earthquake demand in order to meet the needs and performance objectives of building owners and other stakeholders. ASCE 41 employs a PBEE design methodology that allows building owners, design professionals, and the local building code authorities to establish seismic hazard levels and performance goals for individual buildings.

2.2.1 Site Class Definition

The building site class definition quantifies the site soil's propensity to amplify or attenuate earthquake ground motion propagating from underlying rock. Site class has a direct impact on the seismic design forces utilized to design and evaluate a structure. There are six distinct site classes defined in ASCE 7-16, Site Class A through Site Class F, that range from hard rock to soils that fail such as liquefiable soils. Buildings located on soft or loose soils will typically sustain more damage than similar buildings located on stiff soils or rock, all other things being equal. The Washington State Department of Natural Resources measured the time-averaged shear-wave velocity at each site to 30 meters (100 feet) below the ground surface, Vs30. This measured shear-wave velocity was used to determine the site class. The site class for this building was determined to be **Site Class E**.

2.2.2 Hoquiam Fire Department Building Seismicity

Seismic hazards for the United States have been quantified by the United States Geological Survey (USGS). The information has been used to create seismic hazard maps, which are currently used in building codes to determine the design-level earthquake magnitudes for building design.

The Level of Seismicity is categorized as Very Low, Low, Moderate, or High based on the probabilistic ground accelerations. Ground accelerations and mass generate inertial (seismic) forces within a building (Force = mass x acceleration). Ground acceleration therefore is the parameter that classifies the level of seismicity. From geographic region to region, as the ground accelerations increase, so does the level of seismicity (from low to high). Where this building is located, the design short-period spectral acceleration, S_{DS}, is 1.324 g, and the design 1-second period spectral acceleration, S_{D1}, is 1.978 g. Based on ASCE 41 Table 2-4, the Level of Seismicity for this building is classified as **High**.

The ASCE 41 Basic Performance Objective for Existing Buildings (BPOE) makes use of the Basic Safety Earthquake – 1E (BSE-1E) seismic hazard level and the Basic Safety Earthquake – 2E (BSE-2E). The BSE-1E earthquake is defined by ASCE 41 as the probabilistic ground motion with a 20 percent probability of exceedance in 50 years, or otherwise characterized as a ground motion acceleration with a probabilistic 225-year return period. The BSE-2E earthquake is defined by ASCE 41 as the probabilistic ground motion with a 5 percent probability of exceedance in 50 years, or otherwise characterized as a ground motion acceleration with a probabilistic 975-year return period. The BSE-2N seismic hazard level is the Maximum Considered Earthquake (MCE) ground motion used in current codes for the design of new buildings and is also used in ASCE 41 to classify the Level of Seismicity for a building. The BSE-2N has a statistical ground motion acceleration with 2 percent probability of exceedance in 50 years, or otherwise characterized as a ground motion acceleration with a probabilistic 2,475-year return period.

Table 2.2.1-1 provides the spectral accelerations for the 225-year, 975-year, and 2,475-year return interval events specific to Hoquiam Fire Station that are considered in this study.

Table 2.2.1-1. Spectral Acceleration Parameters (Site Class E).

BSE-1E 20%/50 (225-year) Event		BSE-1N 2/3 of 2,475-year Event		BSE-2E 5%/50 (975-year) Event		BSE-2N 2%/50 (2,475-year) Event	
0.2 Seconds	0.789 g	0.2 Seconds	1.324 g	0.2 Seconds	1.416 g	0.2 Seconds	1.986 g
1.0 Seconds	0.507 g	1.0 Seconds	1.978 g	1.0 Seconds	1.961 g	1.0 Seconds	2.967 g

2.2.3 Hoquiam Fire Station Structural Performance Objective

The fire station is a mixed-use occupancy that is considered an essential facility (Risk Category IV) that would be required to be immediately occupiable following an earthquake. According to ASCE 41, the BPOE for Risk Category IV structures is the Immediate Occupancy structural performance level at the BSE-1E seismic hazard level and the Life Safety structural performance level at the BSE-2E seismic hazard level. The ASCE 41 Tier 1 evaluations were conducted in accordance with ASCE 41 requirements and ASCE 41 seismic performance levels. Concept-level upgrades were developed for the **Immediate Occupancy** structural performance level at the **BSE-1N** seismic hazard level in accordance with DNR direction, the project scope of work, and the project legislative language.

At the Immediate Occupancy structural performance level, only very limited structural damage should occur following an earthquake. The building's vertical and lateral force resisting systems should also retain almost all of its pre-earthquake strength and stiffness and it is anticipated that continued use of the building would not be limited by its structural conditions. However, there may be limited damage or disruption to nonstructural elements of the building. The overall risk of life-threatening injury as a result of structural damage is anticipated to be very low and although some minor structural repairs might be necessary, these repairs would generally not be required before reoccupying the building.

Knowledge Factor

A knowledge factor, *k*, is an ASCE 41 prescribed factor that is used to account for uncertainty in the as-built data considering the selected Performance Objective and data collection processes (availability of existing drawings, visual observation, and level of materials testing). No in-situ testing of building materials was performed; however, some material properties and existing construction information were provided in the existing record drawings. If the concept design is developed further, additional materials tests and site investigations will be required to substantiate assumptions about the existing framing systems.

ASCE 41 Classified Building Type

Use of ASCE 41 for seismic evaluations requires buildings to be classified from a group of common building types historically defined in previous seismic evaluation standards (ATC-14, FEMA 310, and ASCE 31-03). The fire station is classified in ASCE 41 Table 3-1 as a reinforced masonry shear wall building with flexible diaphragms, **RM1**. Reinforced masonry shear wall buildings (RM1) include those that have bearing shear walls constructed of reinforced masonry with elevated floor and roof framing structural systems consisting of wood framing.

2.3 Report Limitations

The professional services described in this report were performed based on available record drawing information and limited visual observation of the structure. No other warranty is made as to the professional advice included in this report. This report provides an overview of the seismic evaluation results and does not address programming and planning issues. This report has been prepared for the exclusive use of DNR/WGS and is not intended for use by other parties, as it may not contain sufficient information for purposes of other parties or their uses.

3.0 Building Description & Seismic Evaluation Findings

3.1 Building Overview

3.1.1 Building Description

Original Year Built: 1971
Building Code: 1970 UBC

Number of Stories: 2
Floor Area: 12,908 SF

FEMA Building Type: RM1
ASCE 41 Level of Seismicity: High
Site Class: E

The Hoquiam Fire Department building has a somewhat rectangular footprint, with two projections at the west side, with an approximate total area of 12,900 square feet. The building has a large four-bay apparatus bay to the northeast side and an administrative/living-quarter area to the southwest. Both areas are two stories, although the apparatus bay area is a high-bay structure. The walls are generally composed of concrete masonry unit (CMU), with a few wood stud-walls at the second level. The roof and floor above the apparatus bays are flexible wood diaphragms. There is an 8-inch-thick concrete elevated slab at the second floor, over the administrative side of the building. The lateral system is comprised of CMU shear walls, a rigid second floor diaphragm at the administrative area, and flexible wood diaphragms at the roof.

3.1.2 Building Use

This building is the main fire department facility that serves Hoquiam. The building has four apparatus bays and can house several fire trucks. It also has a hose tower, sleeping quarters, administrative offices, and kitchen.

3.1.3 Structural System

Table 3.1.3-1. Structural System Descriptions.

Structural System	Description
Roof	The roof is a 3:12 hipped roof consisting of roof tiles over a tongue-and-groove straight sheathing that is supported by glulam beam rafters. The hose tower has the same construction as the rest of the building, although it is approximately 30 or 40 feet higher than the surrounding roof.
Structural Floor	The "upper storage" area, which has a weight room and what appears to be a small conference space, is an 8-inch-thick cast-in-place concrete slab.

Table 3.1.3-1. Structural System Descriptions.

Structural System	Description
	Continuing up a flight of stairs to the elevated floor above the apparatus bay, that floor is a wood diaphragm similar to the roof: tongue-and-groove decking over glulam beams.
Foundations	The foundation is a deep foundation system with concrete grade beams under the CMU bearing walls bearing on 6-foot deep concrete pedestals, which are founded on timber piles. The apparatus bay slab appears to be constructed in several squares, which are supported at the vertices by a single pile and pile-cap. The interior CMU walls are supported by grade beams and piles; however, these grade beams are not tied to those at the exterior wall. The hose tower is founded on grade beams and pile caps with four piles each.
Gravity System	Roof loads are supported by glulam beams and CMU bearing walls. At the second floor storage area, floor loads are transmitted to CMU bearing walls via an 8-inch-thick one-way elevated concrete slab.
Lateral System	Lateral loads are transmitted through the flexible wood roof diaphragms consisting of tongue-and-groove straight sheathing, and concrete second floor diaphragm, into reinforced CMU shear walls. In several locations, wood structural panel-sheathed stud walls also transmit loads from the roof CMU shear walls below. The CMU shear walls deliver loads to the grade beams at the foundation level.

3.1.4 Structural System Visual Condition

Table 3.1.4-1. Structural System Condition Descriptions.

Structural System	Description
Structural Roof	Good. No visible signs of damage or deterioration.
Structural Floor	Good. No visible signs of damage or deterioration.
Foundations	Not visible during the site visit. Signs of damage, distress, or settlement were not observed.
Gravity System	Good. No visible signs of damage or deterioration.
Masonry Walls	Fair. The CMU walls had shear cracks radiating from square openings at windows and doors in a few locations. It is unclear if this damage was caused by previous seismic activity, or by differential settlements, or both.

3.2 Seismic Evaluation Findings

3.2.1 Structural Seismic Deficiencies

The structural seismic deficiencies identified during the Tier 1 evaluation are summarized below. Commentary for each deficiency is provided based on this evaluation.

Table 3.2.1-1. Identified Structural Seismic Deficiencies Based on Tier 1 Checklists.

Deficiency	Description
Geometry	Based on geometry alone, the step back between the typical roof and hose tower appears to represent a geometric irregularity. It is unclear if the hose tower was designed assuming the typical roof diaphragm is a necessary bracing level; if the diaphragm separates from the tower, will there be instability issues, etc. Further investigation is recommended to better understand the expected dynamic behavior.
Wall Anchorage	No anchorage connections were observed and the limited details on the construction drawings did not shed any additional light. The CMU walls appear to be doweled at the foundation level; however, straps to the roof diaphragm were not found.
Proportions	The height-to-thickness ratio of the hose tower above the roof plane of the surrounding building appears to exceed the limitation.
Plan Irregularities	The roof drawings do not show any sort of straps, which would likely be required to develop the tensile capacity of the diaphragm around the reentrant corners.
Straight Sheathing	The roof diaphragm region over the administrative area appears to be approximately 2-to-1.
Spans	Roof spans are greater than 12 feet between lines of resistance, and the roof is straight sheathed.

3.2.2 Structural Checklist Items Marked as "U"nknown

Where building structural component seismic adequacy was unknown due to lack of available information or limited observation, the structural checklist items were marked as "unknown". These items require further investigation if definitive determination of compliance or noncompliance is desired. The unknown structural checklist items identified during the Tier 1 evaluation are summarized below. Commentary for each unknown item is provided based on the evaluation.

Table 3.2.2-1. Identified Structural Checklist Items Marked as Unknown.

Deficiency	Description
Liquefaction	The ICOS system identifies this site as having moderate to high liquefaction potential. The site is located 1,900 feet from the Grays Harbor shoreline; however, the soil due south of the site between the railroad to the south and the shoreline is only used as farmland. The building itself is founded on piles and is approximately only 12 feet above sea level, and it is assumed there is a moderate to high liquefaction potential. Further investigation by a licensed geotechnical engineer is necessary to verify liquefaction potential.
Slope Failure	There does not appear to be record of surface faulting in this region; however, investigation by a licensed geotechnical engineer is necessary to verify the surface fault rupture potential.
Overturning	There are some concerns with the overturning capacity both of the hose tower and at pilasters at the front and reverse of the vehicle bays. The capacity of the piles could not be confirmed. Also, the capacity of the boundary elements transferring uplift loads could not be verified. Recommend further investigation, including potentially consulting a geotechnical engineer.
Transfer to Shear Walls	The nail size and spacing between the straight sheathing and wood shear walls at the second story could not be found on the details.
Deep Foundations	The upper portion of the piles at the hose tower are concrete; however, they appear to have minimal steel. It appears that the majority of the piles are timber. It is unclear how much lateral capacity these piles have or if lateral loading was even a consideration in their original design. Further investigation is recommended.
Reinforcement at Wall Openings	No information found on the available drawings. Further investigation, potentially with a pacometer, may be necessary to confirm presence of rebar.
Stiffness of Wall Anchors	Connections were not visible and could not be visually verified during the site visit.

3.2.3 Nonstructural Seismic Deficiencies

Table 3.2.3-1 summarizes the seismic deficiencies in the nonstructural systems. The Tier 1 screening checklists are provided in Appendix A.

Table 3.2.3-1. Identified Nonstructural Seismic Deficiencies based on Tier 1 Checklists.

Deficiency	Description
CF-2 Tall Narrow Contents	Tall and narrow contents with a height more than 6 feet and a height-to-depth or height-to-width ratio greater than 3-to-1 should be anchored to the structure or to each other.
CF-3 Fall-Prone Contents	Equipment, stored items, or other contents weighing more than 20 pounds whose center of mass is more than 4 feet above the adjacent floor level should be braced or otherwise restrained.

3.2.4 Nonstructural Checklist Items Marked as "U"nknown

Where building nonstructural component seismic adequacy was unknown due to lack of available information or limited observation, the nonstructural checklist items were marked as "unknown". These items require further investigation if definitive determination of compliance or noncompliance is desired. The unknown nonstructural checklist items identified during the Tier 1 evaluation are summarized below. Commentary for each unknown item is provided based on the evaluation.

Some nonstructural deficiencies may be able to be mitigated by fire department facilities staff. Other nonstructural components that require substantial mitigation may be more appropriately included in a long-term mitigation strategy. Some typical conceptual details for the seismic upgrade of nonstructural components can be found in the FEMA E-74 Excerpts appendix.

Table 3.2.4-1. Identified Nonstructural Checklist Items Marked as Unknown.

Deficiency	Description
M-1 Ties; M-2 Shelf Angles; M-3 Weaken Planes; M-6 Anchorage	Details of the masonry veneer were not found on the available drawings and could not be confirmed in the field.
S-2 Stair Details	The connection details were not found on available drawings and were not visually verified during the site visit. It is unclear if the connection between the stairs relies on post-installed anchors.
ME-1 Fall-Prone Equipment, ME-3 Tall-Narrow Equipment	This was not able to be verified during the site investigation. Further investigation should be performed to see if bracing or anchoring of fall-prone and overhead falling hazard equipment exists. Additional bracing may be appropriate to mitigate seismic risk.

4.0 Recommendations and Considerations

4.1 Seismic-Structural Upgrade Recommendations

Concept-level seismic upgrade recommendations to improve the lateral-force-resisting system were developed. The sketches in Appendix B depict the concept-level structural upgrade recommendations outlined in this section. The following concept recommendations are intended to address the structural deficiencies noted in Table 3.2.1-1. This concept-level seismic upgrade design represents just one of several alternative seismic upgrade design solutions and is based on preliminary seismic evaluation and analysis results. Final analysis and design for seismic upgrades must include a more detailed seismic evaluation of the building in its present or future configuration. Proposed seismic upgrades include the following.

4.1.1 New Plywood Roof Sheathing

Several of the noncompliance issues center around the inadequacy of the straight sheathing: aspect ratios limited to 1-to-1 ("Straight Sheathing") and spans limited to 12 feet ("Spans"). The problem is that the straight-sheathed diaphragm cannot develop the appropriate shear strength for the larger spans and aspect ratios. The roof should be re-sheathed with plywood panels, which will increase the strength and stiffness of the roof diaphragm. It will allow the diaphragm to span greater distances and permit aspect ratios of up to 4-to-1.

4.1.2 Brace CMU Walls to Roof Diaphragm with Straps

It does not appear that the CMU walls are currently braced out-of-plane at the roof diaphragm level. Tension ties such as Simpson LTT should be installed. These straps prevent the heavy cementitious walls from separating from the roof diaphragm due to high out-of-plane inertial forces. Straps or tension ties located at 48 inches on center around the perimeter of the roof structure will be assumed. These tension ties should also be applied between the exterior faces of the four hose tower walls to the surrounding roof diaphragm.

4.1.3 Reinforce Roof Diaphragm at Reentrant Corners

The roof geometry shows two major plan projections to the front and rear of the facility that create two "reentrant corners." Reentrant corners are commonly subject to elevated shear forces caused by semi-independent dynamic responses between the two building projections. In order to reduce the risk of shear failure of the reentrant corners, reinforcement is usually added at the two intersecting perpendicular chords. For wood roof diaphragms, reinforcement typically consists of lengths of coil strap attached to the diaphragm over the chords and continued past the reentrant corner over wood blocking added to the diaphragm underside.

4.1.4 Internal Frame at Hose Tower

Further analysis to the dynamic response of the hose tower to determine the degree of severity of the "Proportions" and "Geometry" deficiencies. Adding tension ties between the hose tower and the typical roof diaphragm should, in theory, provide some helpful bracing of the hose tower. Assuming that further analysis could not be performed, adding a series of light steel framing adjacent to the interior face of the hose tower CMU walls is recommended. If located near the wall face, it would not necessarily block the fire fighter's ability to hang hoses, but it would brace the walls and eliminate the "Proportion" deficiency. It may not fully alleviate the "Geometry" irregularity; however, the stiffening of the tower and the addition of tension ties previously mentioned may mitigate the concerns.

4.2 Foundations and Geotechnical Considerations

A detailed geotechnical analysis of the site soils was not included in the scope of this study. As a result, the geotechnical seismic effects on the existing building and its foundations, such as the presence of liquefiable soils, allowable soil bearing pressures, and pile capacities, are unknown at this time. However, based on state of Washington liquefaction mapping, this building is located on soils classified with a moderate to high susceptibility of liquefaction.

Liquefaction is the tendency of certain soils to saturate and lose strength during strong earthquake shaking, causing it to flow and deform similar to a liquid. Liquefaction, when it occurs, drastically decreases the soil bearing capacity and tends to lead to large differential settlement of soil across a building's footprint. Liquefaction can also cause soils to spread laterally and can dramatically affect a building's response to earthquake motions, all of which can significantly compromise the overall stability of the building and possibly lead to isolated or widespread collapse in extreme cases. Existing foundations damaged as a result of liquefiable soils also make the building much more difficult to repair after an earthquake.

Buildings that are not founded on a raft foundation or deep foundation system (such as grade beams and piles), and those with conventional strip footings and isolated spread footings that are not interconnected well with tie beams, are especially vulnerable to liquefiable soils. Mitigation techniques used to improve structures in liquefiable soils vary based on the type and amount of liquefiable soils and may include ground improvements to densify the soil (aggregate piers, compaction piling, jet grouting), installation of deep foundations (pin piling, augercast piling, micro-piling), and installation of tie beams between existing footings.

The Hoquiam 8th Street Fire Station is founded on timber piling and concrete grade beams and pile caps. It is recommended that a detailed geotechnical study and investigation be completed on the building site to determine the nature of the liquefaction hazard and the characteristics of the site soils. It is also recommended that additional investigation and records research be done to determine the existing foundations for this building. Foundation mitigation and ground improvement is likely required, and the recommended geotechnical investigation could have a major impact on the scope of work required for seismic retrofit.

4.3 Tsunami Considerations

Tsunami analysis was outside the scope of this project. However, based on Washington State Department of Natural Resources tsunami inundation mapping, the location of the building is within the expected tsunami inundation zone for a Cascadia Subduction Zone earthquake. While there is significant uncertainty surrounding tsunami inundation heights, the mapping indicates that there is a likelihood of tsunami inundation at the building location.

It may be worthwhile to conduct a detailed tsunami study prior to performing building seismic upgrades. Since tsunamis can cause significant infrastructure damage and also pose a significant risk to life safety, it can often be more cost effective to build a new fire station outside of the tsunami inundation zone rather than seismically upgrade the existing building. Alternatively, seismically upgrading the facility could allow occupants to safely evacuate and reach locations away from the tsunami inundation zone. Construction of a tsunami vertical evacuation structure may be another alternative to provide safe refuge from a tsunami. In any case, it is recommended that a detailed tsunami evacuation plan be used that gives people a high likelihood of successfully escaping a tsunami regardless of whether the plan is to reach higher ground or take refuge in a vertical evacuation structure. A detailed tsunami study could comparatively evaluate different options and provide recommendations on appropriate actions to take.

4.4 Nonstructural Recommendations and Considerations

Table 3.2.3-1 identifies several nonstructural deficiencies that do not meet the performance objective selected for Hoquiam Fire Station. It is recommended that these deficiencies be addressed to provide nonstructural performance consistent with the performance of the upgraded structural lateral-force-resisting system. As-built information for the existing nonstructural systems, such as fire sprinklers, mechanical ductworks, and piping, are not available for review. Only limited visual observation of the systems was performed during field investigation due to limited access or visibility to observe existing conditions. The conceptual mitigation strategies provided in this study are preliminary only. The final analysis and design for seismic rehabilitation should include a detailed field investigation.

4.4.1 Architectural Systems

This section addresses existing construction that, while not posing specific hazards during a seismic event, would be affected by the seismic improvements proposed.

For any remodel project of an existing building, the International Existing Building Code (IEBC) would be applicable. The intent of the IEBC is to provide flexibility to permit the use of alternative approaches to achieve compliance with minimum requirements to safeguard the public health, safety, and welfare insofar as they are affected by the work being done.

Energy Code

Elements of the exterior building envelope to be affected by the proposed seismic upgrade work may be required to be brought up to the current Washington State Energy Code per Chapter 5, where applicable.

Accessibility

It should also be noted that, as a part of any upgrade to existing buildings, the IEBC will require that any altered primary function spaces (classrooms, gyms, entrances, offices) and routes to these spaces, be made accessible to the current accessibility standards of the Americans with Disabilities Act (ADA), unless technically infeasible.

This would include but is not limited to accessible restrooms, paths of travel, entrances and exits, parking, signage and Life Safety alarm systems. Under no circumstances should the facility be made less accessible. The IEBC does, however, have exceptions for areas that do not contain a primary function (storage room, utility rooms) and states that costs of providing the accessible route are not required to exceed 20 percent of the costs of the alterations affecting the area of Primary Function.

As with any major renovation and modernization, an ADA study should be performed to determine the extent to which an existing facility would need to be improved in order to comply with current ADA requirements.

Hazardous Materials Survey

Given the age of the building, existing construction elements such as floor tile and/or adhesive, pipe insulation, etc., could contain asbestos. Verify that a Hazardous Materials survey and abatement of the building has been performed, prior to the start of any demolition work. Existing plaster ceilings remain and will need to be removed in some areas – verify plaster does not contain asbestos.

New Plywood Roof Sheathing

Portions of the existing furred tile ceiling may need to be removed for access to masonry above ceiling at the new anchors. It may be difficult to match the existing acoustic ceiling tiles that are currently installed. Given the age and condition of the tiles, it may be best to replace all existing ceiling tiles as a part of an overall upgrade.

A reroof project may require additional roof insulation as part of alterations. The drawings show batt insulation laid above the interior ceiling surfaces, creating an unconditioned attic space above. As part of a reroof project, we recommend installing an above-roof continuous rigid insulation of R-38 over the entire roof to comply with current energy code. Any mechanical equipment curbs should be raised to accommodate the thicker insulation. Alternately, additional batt insulation above the ceilings would need to be added to increase the existing R-13 insulation to an R-49.

Brace CMU Walls to Roof Diaphragm with Straps

Portions of the existing furred tile ceiling will need to be removed for access to masonry above at the new strongback walls and anchors. It may be difficult to match the existing acoustic ceiling tiles that are currently installed. Given the age and condition of the tiles, it may be best to replace all existing ceiling tiles in the affected areas as a part of an overall facility upgrade.

Some areas with existing gypsum board ceilings will require removal and repair of portions of the ceiling, requiring repainting of the entire ceiling in affected areas.

Reinforce Roof Diaphragm at Reentrant Corners

Given the extent of additional nailing and new roof sheathing, this work would best be done in conjunction with a building reroof.

Ceiling in Paths of Egress

The suspended ceiling in the main corridor is an integrated acoustical ceiling system, likely with a suspended metal T-grid. Because this corridor is a main path of egress, it is recommended that the ceiling grid support system be further investigated and checked for proper seismic bracing and compression support for every 12 square feet of area and proper edge clearance detailing at the corridor walls. Preventing the risk of a fallen integrated ceiling system will mitigate the risk of obstructions impeding the paths of egress as occupants evacuate the building following a seismic event.

Lighting Fixtures in Paths of Egress

The light fixtures observed in the main corridor are supported within an integrated ceiling system that is over a main path of egress. Maintenance staff should verify that each fixture is independently supported to the roof structure from opposite corners and add wire supports as necessary.

Contents and Furnishings

Buildings often contain various tall and narrow furniture, such as shelving and storage units, that are freestanding away from any backing walls. It is recommended that maintenance staff verify that the tops of the shelving units are braced or anchored to the nearest backing wall or provide overturning base restraint. Heavy items weighing more than 20 pounds on upper shelves or cabinet furniture should also be restrained by netting or cabling to avoid becoming falling hazards to occupants below.

4.4.2 Mechanical Systems

The main seismic concerns for mechanical equipment are sliding, swinging, and overturning. Inadequate lateral restraint or anchorage can shift equipment off its supports, topple equipment to the ground, or dislodge overhead equipment, making them falling hazards. Investigation of above-ceiling mechanical equipment and systems was not part of this study, but an initial investigation for the presence of mechanical equipment bracing can be performed by maintenance and facility staff to see if equipment weighing more than 20 pounds with a center of mass more than 4 feet above the adjacent floor level is laterally braced. If bracing is not present, and the equipment poses a falling hazard to occupants below, further investigation is recommended by a structural engineer.

4.5 Opinion of Probable Conceptual Seismic Upgrades Costs

An opinion of probable project costs of the concept-level seismic upgrade recommendations provided in this report is included in Appendix C. The input of the scope of work to develop the probable costs is the Tier 1 checklists and the preliminary concept-level seismic upgrades design recommendations and sketches. These preliminary concept-level design sketches depict a design concept that could be implemented to improve the seismic safety of the building structure. It is important to note the preliminary seismic upgrades design concept is based on the results of the Tier 1 seismic screening checklists and engineering design judgement and has not been substantiated by detailed structural analyses and calculations.

For this preliminary opinion of probable costs, the estimate of construction costs of the preliminary scope of work is developed based on current 1st Quarter (1Q) 2021 costs. Costs are then escalated to 4Q 2022 at 6% per year of the baseline cost estimate. Costs are developed based on the Tier 1 checklist, concept-level seismic upgrade design sketches, and project narratives.

A range of the cost estimate of -20% (low) to +50% (high) is used to develop the range of the construction cost estimate for the concept-level scope of work. The -20% to +50% range guidance is from Table 1 of the AACE International Recommended Practice 56R-08, *Cost Estimate Classification System*. This estimate is classified as a Class 5 based on the level of design of 0% to 2%. The range of a Class 5 construction cost estimate based on the AACE guidance selected for this estimate is a -20% to +50%.

The estimated total cost (construction costs plus soft costs) to mitigate the deficiencies identified in the Tier 1 checklists of the Hoquiam Fire Station Main Building ranges between approximately $1.28M and $2.39M (-20%/+50%). The baseline estimated total cost to seismically upgrade this building is approximately $1.6M. On a per-square-foot basis, the baseline seismic upgrade cost is estimated to be approximately $124 per square foot in 4Q 2022 dollars, with a range between $99 per square foot and $186 per square foot.

4.5.1 Opinion of Probable Construction Costs

This conceptual opinion of construction cost includes labor, materials, equipment, and scope contingency, general contractor general conditions, home office overhead, and profit. This is based on a public sector design-bid-build project delivery method. Project delivery methods such as negotiated, State of Washington GC/CM, and design-build are not the basis of the construction costs. Owner's soft costs are described below in Section 4.5.2.

The cost is developed in 1Q 2021 costs. The costs are then escalated to 4Q 2022 using an escalation rate of 6.0% per year. If the mid-point of construction will occur at a date earlier or later than 4Q 2022, then it is appropriate to adjust the escalation to the revised mid-point of construction. Construction costs excluded from the opinion are site work, phasing of construction, additional building modifications not directly related to the seismic scope of work, off hours labor costs, accelerated schedule overtime labor costs, replacement/relocation/additional FF+E, and building code changes that occur after this report.

For project budget planning purposes, it is highly recommended that the opinion of probable project costs is determined including: the overall construction budget of the seismic upgrade and additional scope of work for the building via the services of an A/E design team to study the proposed seismic mitigation strategies to refine the concept-level seismic upgrades design approach contained in this report, determine the construction timeline to adjust the escalation costs, define the construction phasing, if any, and the project soft costs.

4.5.2 Opinion of Probable A-E Design Budgets and Owner's Additional Project Costs (Soft Costs)

Additional owner's project costs would likely include owner's project administration costs, including project management, financing/bond costs, administration/contract/accounting costs, review of plans, value engineering studies, building permits, bidding costs, equipment, fixtures, furnishings and technology, and relocation of the fire department staff and operations during construction. These costs are known as soft costs.

These soft costs have been included in the opinion of probable costs at 40% of the baseline probable construction cost for the seismic upgrade of this building.
The soft costs used for the projects that total to 40% are:
A+E Design - 10%
QA/QC Testing - 2%
Project Administration - 2%
Owner Contingency - 11%
Average Washington State Sales Tax - 9%
Building Permits - 6%

It is typical for soft costs to vary from owner to owner. Based upon our team members' experience on fire station projects in the state of Washington, it is our opinion that an allowance of 40% of the average probable construction cost is a reasonable and appropriate soft cost recommendation for planning purposes. We also recommend that each owner develop their own soft costs as part of their budgeting process and not rely solely on this recommended percentage.

4.5.3 Opinion of Escalation Rates

A 6.0%/year construction cost escalation rate is used for planning purposes for the conceptual estimates. The rate is compounded annually to the projected midpoint of construction. This rate is representative of the escalation based on the previous five years of market experience of construction costs throughout the state of Washington and is projected going forward for these projects. This rate is calculated to the 4th Quarter of 2022 as an allowance for planning purposes. The actual construction schedule for the project is to be determined, and we recommend the escalation cost be revised based on revised construction schedule using the 6%/year rate.

Table 4.5.3-1. Seismic Upgrades Opinion of Probable Construction Costs.

Building	FEMA Bldg Type	ASCE 41 Level of Seismicity / Site Class	Structural Performance Objective	Bldg Gross Area	Estimated Seismic Upgrade Cost Range $/SF (Total)	Estimated Seismic Upgrade Cost/SF (Total)
Hoquiam Fire Station, Main Bldg	RM1	High / E	**Structural**			
			Immediate Occupancy	12,908 SF	$44 ($570K) - $83 ($1.07M)	$55 ($712K)
			Nonstructural			
			Immediate Occupancy	12,908 SF	$27 ($342K) - $50 ($641K)	$33 ($427K)
			Total			
				12,908 SF	$71 ($912K) - $133 ($1.71M)	$88 ($1.14M)
					Estimated Soft Costs:	$456K
					Total Estimated Project Costs:	**$1.60M**

W: Wood-Framed; URM: Unreinforced Masonry; RM: Reinforced Masonry; C: Reinforced Concrete; PC: Precast concrete; S: Steel-framed

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Appendix A: ASCE 41 Tier 1 Screening Report

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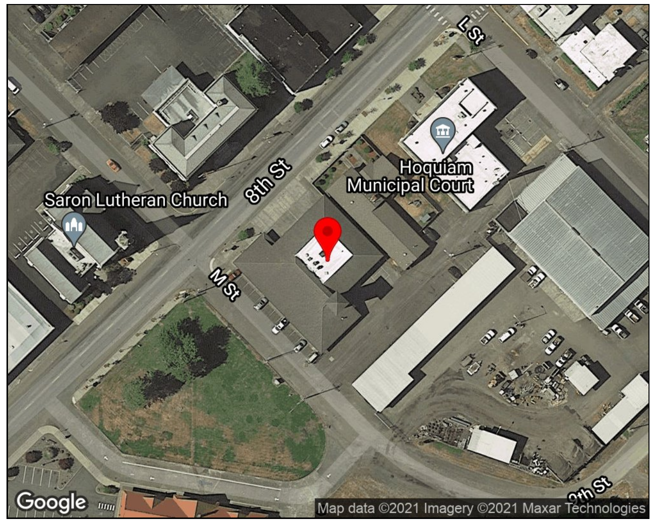
1. Hoquiam, Washington, 8th St. Hoquiam Fire Department, Hoquiam Fire Department

1.1 Building Description

Building Name:	Hoquiam Fire Department
Facility Name:	8th St. Hoquiam Fire Department
District Name:	Hoquiam, Washington
Latitude:	46.974329
Longitude:	-123.887347
Gross Sq. Ft. :	12,908
Number of Stories:	2
Year Built:	1971
Has Building Been Seismically Upgraded?	No
Years of Seismic Upgrade:	
Record Drawings or Other Documents Available?	No
ASCE 41 Level of Seismicity:	High
Is Site Class Known?	Assumed
Site Class:	E
Are the Site Soils Expected to Be Suspecptible to Liquefaction?	Yes
Tsunami Risk:	Extremely High
S_s (BSE-2N)	1.527
S_1 (BSE-2N)	0.706
S_{xs} (BSE-2N)	1.986
S_{x1} (BSE-2N)	
S_{xs} (BSE-2E)	1.416
S_{x1} (BSE-2E)	1.961
S_{ds} (BSE-1N)	1.324
S_{d1} (BSE-1N)	
S_{xs} (BSE-1E)	0.789
S_{x1} (BSE-1E)	0.507



The Hoquiam Fire Department building has a somewhat rectangular footprint, with two projections at the west side, with an approximate total area of 12,900 square feet. The building has a large four-bay garage to the northeast side, and an administrative/living-quarter area to the southwest. Both areas are two story, although the garage area is a high-bay structure. The walls are generally CMU, with a few wood stud walls at the second level. The roof and floor above the garage bays are flexible wood diaphragms. There is an 8-inch thick concrete elevated slab at the second floor, over the administrative side of the building. The lateral system is comprised of concrete masonry unit (CMU) shear walls.

1.1.1 Building Use

This building is the main fire department facility that serves Hoquiam. The building has four garage bays and can house several fire department trucks. It also has a hose tower, sleeping quarters, administrative offices, and kitchen.

1.1.2 Structural System

Table 1.1-1. Structural System Description of 8th St. Hoquiam Fire Department

Structural System	Description
Structural Roof	The roof is a 3:12 hipped roof consisting of roof tiles, over a tongue-and-groove straight sheathing that is supported by glulam beam rafters. The hose tower has the same construction as the rest of the building, although it is approximately 30 or 40 feet higher than the surrounding roof.
Structural Floor(s)	The "upper storage" area, which has a weight room and what appears to be a small conference space, is a 8-inch thick cast in place concrete slab. Continuing up a flight of stairs to the elevated floor above the garage bay, that floor is a wood diaphragm similar to the roof: tongue and groove decking over glulam beams.
Foundations	The foundation is a deep foundation system with concrete grade beams under the CMU bearing walls, founded on 6' deep concrete piles, which are founded on timber piles. The garage slab appears to be constructed in several squares, which of which are supported at the vertices by a single pile and pile-cap. The interior CMU walls are supported by grade beams and piles, however, these grade beams are not tied to those at the exterior wall. The hose tower is founded on grade beams and pile caps with four piles each.
Gravity System	Roof loads are supported by glulam beams and CMU bearing walls. At the second floor storage area, floor loads are transmitted to CMU bearing walls via an 8-inch thick one-way elevated concrete slab.
Lateral System	Lateral loads are transmitted through the flexible wood roof diaphragms consisting of tongue and groove straight sheathing, and concrete second floor diaphragm, into reinforced CMU shear walls. In several locations, wood structural panel sheathed stud walls also transmit loads from the roof CMU shear walls below. The CMU shear walls deliver loads to the grade beams at the foundation level.

1.1.3 Structural System Visual Condition

Table 1.1-2. Structural System Condition Description of 8th St. Hoquiam Fire Department

Structural System	Description
Structural Roof	Good. No visible signs of damage or deterioration.
Structural Floor(s)	Good. No visible signs of damage or deterioration.
Foundations	Not visible during the site visit.
Gravity System	Good. No visible signs of damage or deterioration.

Lateral System	Fair. The CMU walls had shear cracks radiating from square openings at windows and doors in a few locations. It is unclear if this damage was caused by previous seismic activity, or by differential settlements, or both.

Photos:

Figure 1-1. Southwest facade, which is the administrative side of the facility

Figure 1-2. Southeast facade, which is the rear. Fire trucks can pull through the rear to allow them to face "forward" at the entrance.

Figure 1-3. Typical view of a shear crack radiating from a door way.

Figure 1-4. View at the front side of the garage bay.

Figure 1-5. View of the hose tower from the base.

Figure 1-6. Data and storage room at first floor.

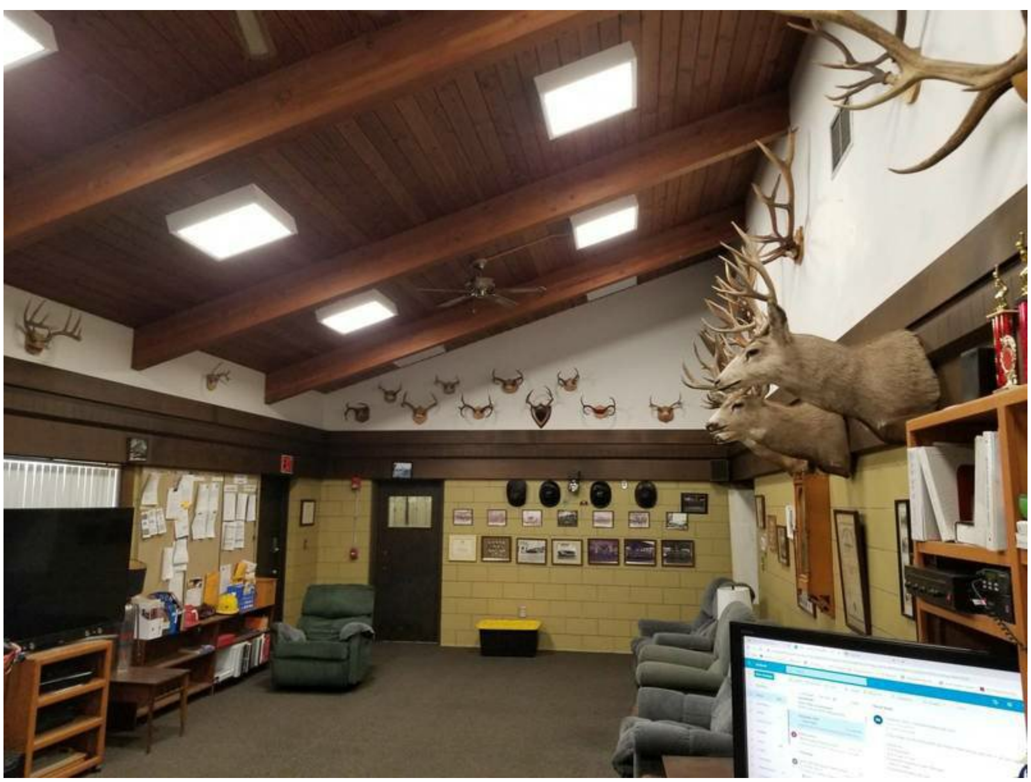


Figure 1-7. View of the lounge/operations area in the administrative wing.

Figure 1-8. View of the weight training room at the second story "storage area".

Figure 1-9. Conference space at the second story "storage area"

Figure 1-10. View of the second story storage area over the garage high-bay.

1.2 Seismic Evaluation Findings

1.2.1 Structural Seismic Deficiencies

The structural seismic deficiencies identified during the Tier 1 evaluation are summarized below. Commentary for each deficiency is also provided based on this evaluation.

Table 1.2-1. Identified Structural Seismic Deficiencies for Hoquiam, Washington 8th St. Hoquiam Fire Department Hoquiam Fire Department

Deficiency	Description
Geometry	Based on geometry alone, the step back between the typical roof and hose tower appears to represent a geometric irregularity. It is unclear if the hose tower was designed assuming the typical roof diaphragm is a necessary bracing level; if the diaphragm separates from the tower, will there be instability issues, etc. Further investigation is recommended to better understand the expected dynamic behavior.
Wall Anchorage	No anchorage connections were observed and the limited details on the construction drawings did not shed any additional light. The CMU walls appear to be doweled at the foundation level, however straps to the roof diaphragm were not found.
Proportions	The height-to-thickness ratio of the hose tower above the roof plane of the surrounding building appears to exceed the limitation.
Plan Irregularities	The roof drawings do not show any sort of straps, which would likely be required to develop the tensile capacity of the diaphragm around the reentrant corners.
Straight Sheathing	The roof diaphragm region over the administrative area appears to be approximately 2-to-1.
Spans	Roof spans are greater than 12 feet between lines of resistance and the roof is straight sheathed.

1.2.2 Structural Checklist Items Marked as Unknown

Where building structural component seismic adequacy was unknown due to lack of available information or limited observation, the structural checklist items were marked as “unknown”. These items require further investigation if definitive determination of compliance or noncompliance is desired. The unknown structural checklist items identified during the Tier 1 evaluation are summarized below. Commentary for each unknown item is also provided based on the evaluation.

Table 1.2-2. Identified Structural Checklist Items Marked as Unknown for Hoquiam, Washington 8th St. Hoquiam Fire Department Hoquiam Fire Department

Unknown Item	Description
Liquefaction	ICOS system identifies this site as having moderate to high liquefaction potential. The site is located 1,900 ft from the Grays Harbor shoreline, however, the soil due south of the site between the railroad to the south and the shoreline is only used as farm land. The building itself is founded on piles and is approximately only 12 feet above sea level, it is assumed there is a moderate to high liquefaction potential. Further investigation by a licensed geotechnical engineer is necessary to verify liquefaction potential.
Surface Fault Rupture	There does not appear to be record of surface faulting in this region; however, investigation by a licensed geotechnical engineer is necessary to verify the surface fault rupture potential.
Overturning	There are some concerns with the overturning capacity both of the hose tower and at pilasters at the front and reverse of the vehicle bays. The capacity of the piles could not be confirmed. Also the capacity of the boundary elements transferring uplift loads could not be verified. Recommend further investigation, including potentially consulting a geotechnical engineer.
Transfer to Shear Walls	The nail size and spacing between the straight sheathing and wood shear walls at the second story could not be found on the details.
Deep Foundations	The upper portion of the piles at the hose tower are concrete, however, they appear to have minimal steel. It appears that the majority of the piles are timber. It is unclear how much lateral capacity these piles have, or if lateral loading was even a consideration in their original design. Further investigation is recommended.
Reinforcing at Wall Openings	No information found on the available drawings. Further investigation, potentially with a pacometer, may be necessary to confirm presence of rebar.
Stiffness of Wall Anchors	Connections were not visible and could not be visually verified during the site visit.

1.3.1 Nonstructural Seismic Deficiencies

The nonstructural seismic deficiencies identified during the Tier 1 evaluation are summarized below. Commentary for each deficiency is also provided based on this evaluation. Some nonstructural deficiencies may be able to be mitigated by school district staff. Other nonstructural components that require more substantial mitigation may be more appropriately included in a long-term mitigation strategy. Some typical conceptual details for the seismic upgrade of nonstructural components can be found in the FEMA E-74 Excerpts appendix.

Table 1.3-1 Identified Nonstructural Seismic Deficiencies for Hoquiam, Washington 8th St. Hoquiam Fire Department Hoquiam Fire Department

Deficiency	Description
CF-2 Tall Narrow Contents. HR-not required; LS-H; PR-MH.	Tall and narrow contents with a height more than 6 feet and a height-to-depth or height-to-width ratio greater than 3-to-1 should be anchored to the structure or to each other.
CF-3 Fall-Prone Contents. HR-not required; LS-H; PR-H.	Equipment, stored items, or other contents weighing more than 20 lb whose center of mass is more than 4 ft above the adjacent floor level should be braced or otherwise restrained.

1.3.2 Nonstructural Checklist Items Marked as Unknown

Where building nonstructural component seismic adequacy was unknown due to lack of available information or limited observation, the nonstructural checklist items were marked as “unknown”. These items require further investigation if definitive determination of compliance or noncompliance is desired. The unknown nonstructural checklist items identified during the Tier 1 evaluation are summarized below. Commentary for each unknown item is also provided based on the evaluation.

Some nonstructural deficiencies may be able to be mitigated by school district staff. Other nonstructural components that require more substantial mitigation may be more appropriately included in a long-term mitigation strategy. Some typical conceptual details for the seismic upgrade of nonstructural components can be found in the FEMA E-74 Excerpts appendix.

Table 1.3-2 Identified Nonstructural Checklist Items Marked as Unknown for Hoquiam, Washington 8th St. Hoquiam Fire Department Hoquiam Fire Department

Unknown Item	Description

Hoquiam, Washington, 8th St. Hoquiam Fire Department, Hoquiam Fire Department

17-3 Immediate Occupancy Basic Configuration Checklist

Building record drawings have been reviewed, when available, and a non-destructive field investigation has been performed for the subject building. Each of the required checklist items are marked Compliant (C), Noncompliant (NC), Not Applicable (N/A), or Unknown (U). Items marked Compliant indicate conditions that satisfy the performance objective, whereas items marked Noncompliant or Unknown indicate conditions that do not. Certain statements might not apply to the building being evaluated.

Very Low Seismicity

Building System - General

EVALUATION ITEM	EVALUATION STATEMENT	C	NC	N/A	U	COMMENT
Load Path	The structure contains a complete, well-defined load path, including structural elements and connections, that serves to transfer the inertial forces associated with the mass of all elements of the building to the foundation. (Tier 2: Sec. 5.4.1.1; Commentary: Sec. A.2.1.10)	X				
Adjacent Buildings	The clear distance between the building being evaluated and any adjacent building is greater than 0.25% of the height of the shorter building in low seismicity, 0.5% in moderate seismicity, and 1.5% in high seismicity. (Tier 2: Sec. 5.4.1.2; Commentary: Sec. A.2.1.2)			X		Nearest adjacent building is on the adjacent property.
Mezzanines	Interior mezzanine levels are braced independently from the main structure or are anchored to the seismic-force-resisting elements of the main structure. (Tier 2: Sec. 5.4.1.3; Commentary: Sec. A.2.1.3)	X				The second floor is cast integral with the CMU interior and exterior walls. The storage room adjacent to the vehicle bay, but above the second floor appears to be braced by a CMU shear wall that runs to the roof diaphragm.

Building System - Building Configuration

EVALUATION ITEM	EVALUATION STATEMENT	C	NC	N/A	U	COMMENT
Weak Story	The sum of the shear strengths of the seismic-force-resisting system in any story in each direction is not less than 80% of the strength in the adjacent story above. (Tier 2: Sec. 5.4.2.1; Commentary: Sec. A.2.2.2)	X				
Soft Story	The stiffness of the seismic-force-resisting system in any story is not less than 70% of the seismic-force-resisting system stiffness in an adjacent story above or less than 80% of the average seismic-force-resisting system stiffness of the three stories above. (Tier 2: Sec. 5.4.2.2; Commentary: Sec. A.2.2.3)	X				

Vertical Irregularities	All vertical elements in the seismic-force-resisting system are continuous to the foundation. (Tier 2: Sec. 5.4.2.3; Commentary: Sec. A.2.2.4)	X				Second story shear resisting elements appear to continue to foundation level.
Geometry	There are no changes in the net horizontal dimension of the seismic-force-resisting system of more than 30% in a story relative to adjacent stories, excluding one-story penthouses and mezzanines. (Tier 2: Sec. 5.4.2.4; Commentary: Sec. A.2.2.5)		X			Based on geometry alone, the step back between the typical roof and hose tower appears to represent a geometric irregularity. It is unclear if the hose tower was designed assuming the typical roof diaphragm is a necessary bracing level; if the diaphragm separates from the tower, will there be instability issues, etc. Further investigation is recommended to better understand the expected dynamic behavior.
Mass	There is no change in effective mass of more than 50% from one story to the next. Light roofs, penthouses, and mezzanines need not be considered. (Tier 2: Sec. 5.4.2.5; Commentary: Sec. A.2.2.6)	X				
Torsion	The estimated distance between the story center of mass and the story center of rigidity is less than 20% of the building width in either plan dimension. (Tier 2: Sec. 5.4.2.6; Commentary: Sec. A.2.2.7)	X				This check only applies to the second floor diaphragm, which is rectangular and surrounded by symmetrically oriented CMU shear walls. As torsional behavior only applies to rigid diaphragms, the inherent torsional (due to stiffness and mass distribution) does not appear to result in a offset exceeding 20% of the width of the diaphragm.

Low Seismicity (Complete the Following Items in Addition to the Items for Very Low Seismicity)

Geologic Site Hazards

EVALUATION ITEM	EVALUATION STATEMENT	C	NC	N/A	U	COMMENT
Liquefaction	Liquefaction-susceptible, saturated, loose granular soils that could jeopardize the building's seismic performance do not exist in the foundation soils at depths within 50 ft (15.2 m) under the building. (Tier 2: Sec. 5.4.3.1; Commentary: Sec. A.6.1.1)				X	ICOS system identifies this site as having moderate to high liquefaction potential. The site is located 1,900 ft from the Grays Harbor shoreline, however, the soil due south of the site between the railroad to the south and the shoreline is only used as farm land. The building itself is founded on piles and is approximately only 12 feet above sea level, it is assumed there is a moderate to high liquefaction potential. Further investigation by a licensed geotechnical engineer is necessary to verify liquefaction potential.
Slope Failure	The building site is located away from potential earthquake-induced slope failures or rockfalls so that it is unaffected by such failures or is capable of accommodating any predicted movements without failure. (Tier 2: Sec. 5.4.3.1; Commentary: Sec. A.6.1.2)			X		Building site and vicinity are flat.
Surface Fault Rupture	Surface fault rupture and surface displacement at the building site are not anticipated. (Tier 2: Sec. 5.4.3.1; Commentary: Sec. A.6.1.3)				X	There does not appear to be record of surface faulting in this region; however, investigation by a licensed geotechnical engineer is necessary to verify the surface fault rupture potential.

High Seismicity (Complete the Following Items in Addition to the Items for Low and Moderate Seismicity)

Foundation Configuration

EVALUATION ITEM	EVALUATION STATEMENT	C	NC	N/A	U	COMMENT
Overturning	The ratio of the least horizontal dimension of the seismic-force-resisting system at the foundation level to the building height (base/height) is greater than 0.6Sa. (Tier 2: Sec. 5.4.3.3; Commentary: Sec. A.6.2.1)				X	There are some concerns with the overturning capacity both of the hose tower and at pilasters at the front and reverse of the vehicle bays. The capacity of the piles could not be confirmed. Also the capacity of the boundary elements transferring uplift loads could not be verified. Recommend further investigation, including potentially consulting a geotechnical engineer.
Ties Between Foundation Elements	The foundation has ties adequate to resist seismic forces where footings, piles, and piers are not restrained by beams, slabs, or soils classified as Site Class A, B, or C. (Tier 2: Sec. 5.4.3.4; Commentary: Sec. A.6.2.2)	X				It should be noted that there are several piles at the vehicle that are not inter connected with tie beams. It does not appear that these need to be tied in order for the building to meet the performance objective. The other piles appear to be interconnected with tie beams.

17-35 Immediate Occupancy Checklist for Building Types RM1 & RM2

Building record drawings have been reviewed, when available, and a non-destructive field investigation has been performed for the subject building. Each of the required checklist items are marked Compliant (C), Noncompliant (NC), Not Applicable (N/A), or Unknown (U). Items marked Compliant indicate conditions that satisfy the performance objective, whereas items marked Noncompliant or Unknown indicate conditions that do not. Certain statements might not apply to the building being evaluated.

Very Low Seismicity

Seismic-Force-Resisting System

EVALUATION ITEM	EVALUATION STATEMENT	C	NC	N/A	U	COMMENT
Redundancy	The number of lines of shear walls in each principal direction is greater than or equal to 2. (Tier 2: Sec. 5.5.1.1; Commentary: Sec. A.3.2.1.1)	X				
Shear Stress Check	The shear stress in the reinforced masonry shear walls, calculated using the Quick Check procedure of Section 4.4.3.3, is less than 70 lb/in.2 (4.83 MPa). (Tier 2: Sec. 5.5.3.1.1; Commentary: Sec. A.3.2.4.1)	X				
Reinforcing Steel	The total vertical and horizontal reinforcing steel ratio in reinforced masonry walls is greater than 0.002 of the wall with the minimum of 0.0007 in either of the two directions; the spacing of reinforcing steel is less than 48 in., and all vertical bars extend to the top of the walls. (Tier 2: Sec. 5.5.3.1.3; Commentary: Sec. A.3.2.4.2)	X				The reinforcement schedule on the available drawings indicates the reinforcement just meets these limits.

Connections

EVALUATION ITEM	EVALUATION STATEMENT	C	NC	N/A	U	COMMENT
Wall Anchorage	Exterior concrete or masonry walls that are dependent on the diaphragm for lateral support are anchored for out-of-plane forces at each diaphragm level with steel anchors, reinforcing dowels, or straps that are developed into the diaphragm. Connections have strength to resist the connection force calculated in the Quick Check procedure of Section 4.4.3.7. (Tier 2: Sec. 5.7.1.1; Commentary: Sec. A.5.1.1)		X			No anchorage connections were observed and the limited details on the construction drawings did not shed any additional light. The CMU walls appear to be doweled at the foundation level, however straps to the roof diaphragm were not found.
Wood Ledgers	The connection between the wall panels and the diaphragm does not induce cross-grain bending or tension in the wood ledgers. (Tier 2: Sec. 5.7.1.3; Commentary: Sec. A.5.1.2)	X				As far as was evident on the available drawings and was observed in the field, this building appears to be compliant.

Transfer to Shear Walls	Diaphragms are connected for transfer of seismic forces to the shear walls, and the connections are able to develop the lesser of the shear strength of the walls or diaphragms. (Tier 2: Sec. 5.7.2; Commentary: Sec. A.5.2.1)				X	The nail size and spacing between the straight sheathing and wood shear walls at the second story could not be found on the details.
Foundation Dowels	Wall reinforcement is doweled into the foundation, and the dowels are able to develop the lesser of the strength of the walls or the uplift capacity of the foundation. (Tier 2: Sec. 5.7.3.4; Commentary: Sec. A.5.3.5)	X				The shear walls are doweled into the foundation in such as manner as to match the size and spacing of vertical wall bars.
Girder-Column Connection	There is a positive connection using plates, connection hardware, or straps between the girder and the column support. (Tier 2: Sec. 5.7.4.1; Commentary: Sec. A.5.4.1)			X		No columns were found. It appears that the large glulam beams bear directly on CMU walls or pilasters. Hangars and steel clips were observed in several of these cases.

Stiff Diaphragms

EVALUATION ITEM	EVALUATION STATEMENT	C	NC	N/A	U	COMMENT
Topping Slab	Precast concrete diaphragm elements are interconnected by a continuous reinforced concrete topping slab. (Tier 2: Sec. 5.6.4; Commentary: Sec. A.4.5.1)			X		The second floor appears to be a cast-in-place concrete slab, not precast planks.
Topping Slab to Walls or Frames	Reinforced concrete topping slabs that interconnect the precast concrete diaphragm elements are doweled for transfer of forces into the shear wall or frame elements. (Tier 2: Sec. 5.7.2; Commentary: Sec. A.5.2.3)			X		The second floor slab appears to be CIP, not precast planks. The existing drawings indicate that the CMU rebar is downed into the second floor cast-in-place slab.

Foundation System

EVALUATION ITEM	EVALUATION STATEMENT	C	NC	N/A	U	COMMENT
Deep Foundations	Piles and piers are capable of transferring the lateral forces between the structure and the soil. (Commentary: Sec. A.6.2.3)				X	The upper portion of the piles at the hose tower are concrete, however, they appear to have minimal steel. It appears that the majority of the piles are timber. It is unclear how much lateral capacity these piles have, or if lateral loading was even a consideration in their original design. Further investigation is recommended.
Sloping Sites	The difference in foundation embedment depth from one side of the building to another does not exceed one story. (Commentary: Sec. A.6.2.4)			X		

Low, Moderate & Hight Seismicity (Complete the Following Items in Addition to the Items for Very Low Seismicity)

Seismic-Force-Resisting System

EVALUATION ITEM	EVALUATION STATEMENT	C	NC	N/A	U	COMMENT
Reinforcing at Wall Openings	All wall openings that interrupt rebar have trim reinforcing on all sides. (Tier 2: Sec. 5.5.3.1.5; Commentary: Sec. A.3.2.4.3)				X	No information found on the available drawings. Further investigation, potentially with a pacometer, may be necessary to confirm presence of rebar.
Proportions	The height-to-thickness ratio of the shear walls at each story is less than 30. (Tier 2: Sec. 5.5.3.1.2; Commentary: Sec. A.3.2.4.4)		X			The height-to-thickness ratio of the hose tower above the roof plane of the surrounding building appears to exceed the limitation.

Diaphragms (Stiff or Flexible)

EVALUATION ITEM	EVALUATION STATEMENT	C	NC	N/A	U	COMMENT
Openings at Shear Walls	Diaphragm openings immediately adjacent to the shear walls are less than 15% of the wall length. (Tier 2: Sec. 5.6.1.3; Commentary: Sec. A.4.1.4)			X		No diaphragm openings found.
Openings at Exterior Masonry Shear Walls	Diaphragm openings immediately adjacent to exterior masonry shear walls are not greater than 4 ft (1.2 m) long. (Tier 2: Sec. 5.6.1.3; Commentary: Sec. A.4.1.6)			X		No diaphragm openings found.
Plan Irregularities	There is tensile capacity to develop the strength of the diaphragm at reentrant corners or other locations of plan irregularities. (Tier 2: Sec. 5.6.1.4; Commentary: Sec. A.4.1.7)		X			The roof drawings do not show any sort of straps, which would likely be required to develop the tensile capacity of the diaphragm around the reentrant corners.
Diaphragm Reinforcement at Openings	There is reinforcing around all diaphragm openings larger than 50% of the building width in either major plan dimension. (Tier 2: Sec. 5.6.1.5; Commentary: Sec. A.4.1.8)			X		No diaphragm openings larger than 50% of the building width were found.
Cross Ties	There are continuous cross ties between diaphragm chords. (Tier 2: Sec. 5.6.1.2; Commentary: Sec. A.4.1.2)	X				
Straight Sheathing	All straight-sheathed diaphragms have aspect ratios less than 1-to-1 in the direction being considered. (Tier 2: Sec. 5.6.2; Commentary: Sec. A.4.2.1)		X			The roof diaphragm region over the administrative area appears to be approximately 2-to-1.
Spans	All wood diaphragms with spans greater than 12 ft (3.6 m) consist of wood structural panels or diagonal sheathing. (Tier 2: Sec. 5.6.2; Commentary: Sec. A.4.2.2)		X			Roof spans are greater than 12 feet between lines of resistance and the roof is straight sheathed.

Diagonally Sheathed & Unblocked Diaphragms	All diagonally sheathed or unblocked wood structural panel diaphragms have horizontal spans less than 30 ft (9.2 m) and aspect ratios less than or equal to 3-to-1. (Tier 2: Sec. 5.6.2; Commentary: Sec. A.4.2.3)			X		Roof is straight sheathed.
Nonconcrete Filled Diaphragms	Untopped metal deck diaphragms or metal deck diaphragms with fill other than concrete consist of horizontal spans of less than 40 ft (12.2 m) and have aspect ratios less than 4-to-1. (Tier 2: Sec. 5.6.3; Commentary: Sec. A.4.3.1)			X		Roof is straight sheathed with wood planks.
Other Diaphragms	Diaphragms do not consist of a system other than wood, metal deck, concrete, or horizontal bracing. (Tier 2: Sec. 5.6.5; Commentary: Sec. A.4.7.1)	X				

Connections

EVALUATION ITEM	EVALUATION STATEMENT	C	NC	N/A	U	COMMENT
Stiffness of Wall Anchors	Anchors of concrete or masonry walls to wood structural elements are installed taut and are stiff enough to limit the relative movement between the wall and the diaphragm to no greater than 1/8 in. before engagement of the anchors. (Tier 2: Sec. 5.7.1.2; Commentary: Sec. A.5.1.4)				X	Connections were not visible and could not be visually verified during the site visit.

Hoquiam, Washington, 8th St. Hoquiam Fire Department, Hoquiam Fire Department

17-38 Nonstructural Checklist

Notes:
C = Compliant, NC = Noncompliant, N/A = Not Applicable, and U = Unknown.
Performance Level: HR = Hazards Reduced, LS = Life Safety, and PR = Position Retention.
Level of Seismicity: L = Low, M = Moderate, and H = High

Life Safety Systems

EVALUATION ITEM	EVALUATION STATEMENT	C	NC	N/A	U	COMMENT
LSS-1 Fire Suppression Piping. HR-not required; LS-LMH; PR-LMH.	Fire suppression piping is anchored and braced in accordance with NFPA-13. (Tier 2: Sec. 13.7.4; Commentary: Sec. A.7.13.1)			X		No fire suppression system found.
LSS-2 Flexible Couplings. HR-not required; LS-LMH; PR-LMH.	Fire suppression piping has flexible couplings in accordance with NFPA-13. (Tier 2: Sec. 13.7.4; Commentary: Sec. A.7.13.2)			X		No fire suppression system found.
LSS-3 Emergency Power. HR-not required; LS-LMH; PR-LMH.	Equipment used to power or control Life Safety systems is anchored or braced. (Tier 2: Sec. 13.7.7; Commentary: Sec. A.7.12.1)	X				Generator at building exterior is anchored independently of the building.
LSS-4 Stair and Smoke Ducts. HR-not required; LS-LMH; PR-LMH.	Stair pressurization and smoke control ducts are braced and have flexible connections at seismic joints. (Tier 2: Sec. 13.7.6; Commentary: Sec. A.7.14.1)			X		No stair pressurization or smoke control ducts found.
LSS-5 Sprinkler Ceiling Clearance. HR-not required; LS-MH; PR-MH.	Penetrations through panelized ceilings for fire suppression devices provide clearances in accordance with NFPA-13. (Tier 2: Sec. 13.7.4; Commentary: Sec. A.7.13.3)			X		No fire suppression system found.
LSS-6 Emergency Lighting. HR-not required; LS-not required; PR-LMH	Emergency and egress lighting equipment is anchored or braced. (Tier 2: Sec. 13.7.9; Commentary: Sec. A.7.3.1)	X				

Hazardous Materials

EVALUATION ITEM	EVALUATION STATEMENT	C	NC	N/A	U	COMMENT
HM-1 Hazardous Material Equipment. HR-LMH; LS-LMH; PR-LMH.	Equipment mounted on vibration isolators and containing hazardous material is equipped with restraints or snubbers. (Tier 2: Sec. 13.7.1; Commentary: Sec. A.7.12.2)			X		No equipment with hazardous materials found.
HM-2 Hazardous Material Storage. HR-LMH; LS-LMH; PR-LMH.	Breakable containers that hold hazardous material, including gas cylinders, are restrained by latched doors, shelf lips, wires, or other methods. (Tier 2: Sec. 13.8.3; Commentary: Sec. A.7.15.1)	X				Hazardous material lockers used and oxygen gas cylinders appear to be braced by a chain attached to the adjacent walls.

HM-3 Hazardous Material Distribution. HR-MH; LS-MH; PR-MH.	Piping or ductwork conveying hazardous materials is braced or otherwise protected from damage that would allow hazardous material release. (Tier 2: Sec. 13.7.3, 13.7.5; Commentary: Sec. A.7.13.4)			X		No distribution system observed.
HM-4 Shutoff Valves. HR-MH; LS-MH; PR-MH.	Piping containing hazardous material, including natural gas, has shutoff valves or other devices to limit spills or leaks. (Tier 2: Sec. 13.7.3, 13.7.5; Commentary: Sec. A.7.13.3)			X		
HM-5 Flexible Couplings. HR-LMH; LS-LMH; PR-LMH.	Hazardous material ductwork and piping, including natural gas piping, have flexible couplings. (Tier 2: Sec. 13.7.3, 13.7.5; Commentary: Sec. A.7.15.4)			X		
HM-6 Piping or Ducts Crossing Seismic Joints. HR-MH; LS-MH; PR-MH.	Piping or ductwork carrying hazardous material that either crosses seismic joints or isolation planes or is connected to independent structures has couplings or other details to accommodate the relative seismic displacements. (Tier 2: Sec. 13.7.3, 13.7.5, 13.7.6; Commentary: Sec. A.7.13.6)			X		

Partitions

EVALUATION ITEM	EVALUATION STATEMENT	C	NC	N/A	U	COMMENT
P-1 Unreinforced Masonry. HR-LMH; LS-LMH; PR-LMH.	Unreinforced masonry or hollow-clay tile partitions are braced at a spacing of at most 10 ft (3.0 m) in Low or Moderate Seismicity, or at most 6 ft (1.8 m) in High Seismicity. (Tier 2: Sec. 13.6.2; Commentary: Sec. A.7.1.1)			X		No unreinforced masonry partitions found.
P-2 Heavy Partitions Supported by Ceilings. HR-LMH; LS-LMH; PR-LMH.	The tops of masonry or hollow-clay tile partitions are not laterally supported by an integrated ceiling system. (Tier 2: Sec. 13.6.2; Commentary: Sec. A.7.2.1)	X				
P-3 Drift. HR-not required; LS-MH; PR-MH.	Rigid cementitious partitions are detailed to accommodate the following drift ratios: in steel moment frame, concrete moment frame, and wood frame buildings, 0.02; in other buildings, 0.005. (Tier 2: Sec. 13.6.2; Commentary: Sec. A.7.1.2)	X				
P-4 Light Partitions Supported by Ceilings. HR-not required; LS-not required; PR-MH.	The tops of gypsum board partitions are not laterally supported by an integrated ceiling system. (Tier 2: Sec. 13.6.2; Commentary: Sec. A.7.2.1)			X		
P-5 Structural Separations. HR-not required; LS-not required; PR-MH.	Partitions that cross structural separations have seismic or control joints. (Tier 2: Sec. 13.6.2; Commentary: Sec. A.7.1.3)			X		
P-6 Tops. HR-not required; LS-not required; PR-MH.	The tops of ceiling-high framed or panelized partitions have lateral bracing to the structure at a spacing equal to or less than 6 ft (1.8 m). (Tier 2: Sec. 13.6.2; Commentary: Sec. A.7.1.4)			X		

Ceilings

EVALUATION ITEM	EVALUATION STATEMENT	C	NC	N/A	U	COMMENT
C-1 Suspended Lath and Plaster. HR-H; LS-MH; PR-LMH.	Suspended lath and plaster ceilings have attachments that resist seismic forces for every 12 ft2 (1.1 m2) of area. (Tier 2: Sec. 13.6.4; Commentary: Sec. A.7.2.3)			X		No suspended lath and plaster ceilings found.
C-2 Suspended Gypsum Board. HR-not required; LS-MH; PR-LMH.	Suspended gypsum board ceilings have attachments that resist seismic forces for every 12 ft2 (1.1 m2) of area. (Tier 2: Sec. 13.6.4; Commentary: Sec. A.7.2.3)			X		No suspended gypsum board ceilings found.
C-3 Integrated Ceilings. HR-not required; LS-not required; PR-MH.	Integrated suspended ceilings with continuous areas greater than 144 ft2 (13.4 m2) and ceilings of smaller areas that are not surrounded by restraining partitions are laterally restrained at a spacing no greater than 12 ft (3.6 m) with members attached to the structure above. Each restraint location has a minimum of four diagonal wires and compression struts, or diagonal members capable of resisting compression. (Tier 2: Sec. 13.6.4; Commentary: Sec. A.7.2.2)			X		
C-4 Edge Clearance. HR-not required; LS-not required; PR-MH.	The free edges of integrated suspended ceilings with continuous areas greater than 144 ft2 (13.4 m2) have clearances from the enclosing wall or partition of at least the following: in Moderate Seismicity, 1/2 in. (13 mm); in High Seismicity, 3/4 in. (19 mm). (Tier 2: Sec. 13.6.4; Commentary: Sec. A.7.2.4)			X		
C-5 Continuity Across Structure Joints. HR-not required; LS-not required; PR-MH.	The ceiling system does not cross any seismic joint and is not attached to multiple independent structures. (Tier 2: Sec. 13.6.4; Commentary: Sec. A.7.2.5)			X		
C-6 Edge Support. HR-not required; LS-not required; PR-H.	The free edges of integrated suspended ceilings with continuous areas greater than 144 ft2 (13.4 m2) are supported by closure angles or channels not less than 2 in. (51 mm) wide. (Tier 2: Sec. 13.6.4 ; Commentary: Sec. A.7.2.6)			X		
C-7 Seismic Joints. HR-not required; LS-not required; PR-H.	Acoustical tile or lay-in panel ceilings have seismic separation joints such that each continuous portion of the ceiling is no more than 2,500 ft2 (232.3 m2) and has a ratio of long-to-short dimension no more than 4-to-1. (Tier 2: Sec. 13.6.4; Commentary: Sec. A.7.2.7)			X		

Light Fixtures

EVALUATION ITEM	EVALUATION STATEMENT	C	NC	N/A	U	COMMENT
LF-1 Independent Support. HR-not required; LS-MH; PR-MH.	Light fixtures that weigh more per square foot than the ceiling they penetrate are supported independent of the grid ceiling suspension system by a minimum of two wires at diagonally opposite corners of each fixture. (Tier 2: Sec. 13.6.4, 13.7.9; Commentary: Sec. A.7.3.2)	X				This only appears to occur in the roof with the data servers. There is an integrated ceiling, but the light fixtures are above that ceiling plane. It does not appear that these fixtures are braced against lateral loads, however they do appear to be free to swing without damage.
LF-2 Pendant Supports. HR-not required; LS-not required; PR-H.	Light fixtures on pendant supports are attached at a spacing equal to or less than 6 ft. Unbraced suspended fixtures are free to allow a 360-degree range of motion at an angle not less than 45 degrees from horizontal without contacting adjacent components. Alternatively, if rigidly supported and/or braced, they are free to move with the structure to which they are attached without damaging adjoining components. Additionally, the connection to the structure is capable of accommodating the movement without failure. (Tier 2: Sec. 13.7.9; Commentary: Sec. A.7.3.3)			X		
LF-3 Lens Covers. HR-not required; LS-not required; PR-H.	Lens covers on light fixtures are attached with safety devices. (Tier 2: Sec. 13.7.9; Commentary: Sec. A.7.3.4)			X		

Cladding and Glazing

EVALUATION ITEM	EVALUATION STATEMENT	C	NC	N/A	U	COMMENT
CG-1 Cladding Anchors. HR-MH; LS-MH; PR-MH.	Cladding components weighing more than 10 lb/ft2 (0.48 kN/m2) are mechanically anchored to the structure at a spacing equal to or less than the following: for Life Safety in Moderate Seismicity, 6 ft (1.8 m); for Life Safety in High Seismicity and for Position Retention in any seismicity, 4 ft (1.2 m) (Tier 2: Sec. 13.6.1; Commentary: Sec. A.7.4.1)			X		No cladding systems found. Building has a masonry brick veneer.
CG-2 Cladding Isolation. HR-not required; LS-MH; PR-MH.	For steel or concrete moment-frame buildings, panel connections are detailed to accommodate a story drift ratio by the use of rods attached to framing with oversize holes or slotted holes of at least the following: for Life Safety in Moderate Seismicity, 0.01; for Life Safety in High Seismicity and for Position Retention in any seismicity, 0.02, and the rods have a length-to-diameter ratio of 4.0 or less. (Tier 2: Sec. 13.6.1; Commentary: Sec. A.7.4.3)			X		

EVALUATION ITEM	EVALUATION STATEMENT	C	NC	N/A	U	COMMENT
CG-3 Multi-Story Panels. HR-MH; LS-MH; PR-MH.	For multi-story panels attached at more than one floor level, panel connections are detailed to accommodate a story drift ratio by the use of rods attached to framing with oversize holes or slotted holes of at least the following: for Life Safety in Moderate Seismicity, 0.01; for Life Safety in High Seismicity and for Position Retention in any seismicity, 0.02, and the rods have a length-to-diameter ratio of 4.0 or less. (Tier 2: Sec. 13.6.1; Commentary: Sec. A.7.4.4)			X		
C-4 Threaded Rods. HR-not required; LS-MH; PR-MH.	Threaded rods for panel connections detailed to accommodate drift by bending of the rod have a length-to-diameter ratio greater than 0.06 times the story height in inches for Life Safety in Moderate Seismicity and 0.12 times the story height in inches for Life Safety in High Seismicity and Position Retention in any seismicity. (Tier 2: Sec. 13.6.1; Commentary: Sec. A.7.4.9)			X		
CG-5 Panel Connections. HR-MH; LS-MH; PR-MH.	Cladding panels are anchored out of plane with a minimum number of connections for each wall panel, as follows: for Life Safety in Moderate Seismicity, 2 connections; for Life Safety in High Seismicity and for Position Retention in any seismicity, 4 connections. (Tier 2: Sec. 13.6.1.4; Commentary: Sec. A.7.4.5)			X		
CG-6 Bearing Connections. HR-MH; LS-MH; PR-MH.	Where bearing connections are used, there is a minimum of two bearing connections for each cladding panel. (Tier 2: Sec. 13.6.1.4; Commentary: Sec. A.7.4.6)			X		
CG-7 Inserts. HR-MH; LS-MH; PR-MH.	Where concrete cladding components use inserts, the inserts have positive anchorage or are anchored to reinforcing steel. (Tier 2: Sec. 13.6.1.4; Commentary: Sec. A.7.4.7)			X		
CG-8 Overhead Glazing. HR-not required; LS-MH; PR-MH.	Glazing panes of any size in curtain walls and individual interior or exterior panes more than 16 ft2 (1.5 m2) in area are laminated annealed or laminated heat-strengthened glass and are detailed to remain in the frame when cracked. (Tier 2: Sec. 13.6.1.5; Commentary: Sec. A.7.4.8)			X		

Masonry Veneer

EVALUATION ITEM	EVALUATION STATEMENT	C	NC	N/A	U	COMMENT
M-1 Ties. HR-not required; LS-LMH; PR-LMH.	Masonry veneer is connected to the backup with corrosion-resistant ties. There is a minimum of one tie for every 2-2/3 ft2 (0.25 m2), and the ties have spacing no greater than the following: for Life Safety in Low or Moderate Seismicity, 36 in. (914 mm); for Life Safety in High Seismicity and for Position Retention in any seismicity, 24 in. (610 mm). (Tier 2: Sec. 13.6.1.2; Commentary: Sec. A.7.5.1)				X	Details of the masonry veneer were not found on the available drawings and could not be confirmed in the field.

M-2 Shelf Angles. HR-not required; LS-LMH; PR-LMH.	Masonry veneer is supported by shelf angles or other elements at each floor above the ground floor. (Tier 2: Sec. 13.6.1.2; Commentary: Sec. A.7.5.2)				X	Details of the masonry veneer were not found on the available drawings and could not be confirmed in the field.
M-3 Weakened Planes. HR-not required; LS-LMH; PR-LMH.	Masonry veneer is anchored to the backup adjacent to weakened planes, such as at the locations of flashing. (Tier 2: Sec. 13.6.1.2; Commentary: Sec. A.7.5.3)				X	Details of the masonry veneer were not found on the available drawings and could not be confirmed in the field.
M-4 Unreinforced Masonry Backup. HR-LMH; LS-LMH; PR-LMH.	There is no unreinforced masonry backup. (Tier 2: Sec. 13.6.1.1, 13.6.1.2; Commentary: Sec. A.7.7.2)	X				Details were not found on the available drawings or confirmed in the field.
M-5 Stud Tracks. HR-not required; LS-MH; PR-MH.	For veneer with coldformed steel stud backup, stud tracks are fastened to the structure at a spacing equal to or less than 24 in. (610 mm) on center. (Tier 2: Sec. 13.6.1.1, 13.6.1.2; Commentary: Sec. A.7.6.)			X		No cold form steel studs found.
M-6 Anchorage. HR-not required; LS-MH; PR-MH.	For veneer with concrete block or masonry backup, the backup is positively anchored to the structure at a horizontal spacing equal to or less than 4 ft along the floors and roof. (Tier 2: Sec. 13.6.1.1, 13.6.1.2; Commentary: Sec. A.7.7.1)				X	Details of the masonry veneer were not found on the available drawings and could not be confirmed in the field.
M-7 Weep Holes. HR-not required; LS-not required; PR-MH.	In veneer anchored to stud walls, the veneer has functioning weep holes and base flashing. (Tier 2: Sec. 13.6.1.2; Commentary: Sec. A.7.5.6)			X		
M-8 Openings. HR-not required; LS-not required; PR-MH.	For veneer with cold-formed-steel stud backup, steel studs frame window and door openings. (Tier 2: Sec. 13.6.1.1, 13.6.1.2; Commentary: Sec. A.7.6.2)			X		

Parapets, Cornices, Ornamentation, and Appendages

EVALUATION ITEM	EVALUATION STATEMENT	C	NC	N/A	U	COMMENT
PCOA-1 URM Parapets or Cornices. HR-LMH; LS-LMH; PR-LMH.	Laterally unsupported unreinforced masonry parapets or cornices have height-tothickness ratios no greater than the following: for Life Safety in Low or Moderate Seismicity, 2.5; for Life Safety in High Seismicity and for Position Retention in any seismicity, 1.5. (Tier 2: Sec. 13.6.5; Commentary: Sec. A.7.8.1)			X		There are no unreinforced parapets, cornices, appendages, etc. found. The hose tower structure is reinforced CMU.
PCOA-2 Canopies. HR-not required; LS-LMH; PR-LMH.	Canopies at building exits are anchored to the structure at a spacing no greater than the following: for Life Safety in Low or Moderate Seismicity, 10 ft (3.0 m); for Life Safety in High Seismicity and for Position Retention in any seismicity, 6 ft (1.8 m). (Tier 2: Sec. 13.6.6; Commentary: Sec. A.7.8.2)			X		No canopies found.
PCOA-3 Concrete Parapets. HR-H; LS-MH; PR-LMH.	Concrete parapets with height-to-thickness ratios greater than 2.5 have vertical reinforcement. (Tier 2: Sec. 13.6.5; Commentary: Sec. A.7.8.3)			X		No concrete parapets found.

PCOA-4 Appendages. HR-MH; LS-MH; PR-LMH.	Cornices, parapets, signs, and other ornamentation or appendages that extend above the highest point of anchorage to the structure or cantilever from components are reinforced and anchored to the structural system at a spacing equal to or less than 6 ft (1.8 m). This evaluation statement item does not apply to parapets or cornices covered by other evaluation statements. (Tier 2: Sec. 13.6.6; Commentary: Sec. A.7.8.4)			X		

Masonry Chimneys

EVALUATION ITEM	EVALUATION STATEMENT	C	NC	N/A	U	COMMENT
MC-1 URM Chimneys. HR-LMH; LS-LMH; PR-LMH.	Unreinforced masonry chimneys extend above the roof surface no more than the following: for Life Safety in Low or Moderate Seismicity, 3 times the least dimension of the chimney; for Life Safety in High Seismicity and for Position Retention in any seismicity, 2 times the least dimension of the chimney. (Tier 2: Sec. 13.6.7; Commentary: Sec. A.7.9.1)			X		
MC-2 Anchorage. HR-LMH; LS-LMH; PR-LMH.	Masonry chimneys are anchored at each floor level, at the topmost ceiling level, and at the roof. (Tier 2: Sec. 13.6.7; Commentary: Sec. A.7.9.2)			X		

Stairs

EVALUATION ITEM	EVALUATION STATEMENT	C	NC	N/A	U	COMMENT
S-1 Stair Enclosures. HR-not required; LS-LMH; PR-LMH.	Hollow-clay tile or unreinforced masonry walls around stair enclosures are restrained out of plane and have height-to-thickness ratios not greater than the following: for Life Safety in Low or Moderate Seismicity, 15-to-1; for Life Safety in High Seismicity and for Position Retention in any seismicity, 12-to-1. (Tier 2: Sec. 13.6.2, 13.6.8; Commentary: Sec. A.7.10.1)			X		The stairs are adjacent to reinforced CMU masonry walls.
S-2 Stair Details. HR-not required; LS-LMH; PR-LMH.	The connection between the stairs and the structure does not rely on post-installed anchors in concrete or masonry, and the stair details are capable of accommodating the drift calculated using the Quick Check procedure of Section 4.4.3.1 for moment-frame structures or 0.5 in. for all other structures without including any lateral stiffness contribution from the stairs. (Tier 2: Sec. 13.6.8; Commentary: Sec. A.7.10.2)				X	The connection details were not found on available drawings and were not visually verified during the site visit.

Contents and Furnishings

EVALUATION ITEM	EVALUATION STATEMENT	C	NC	N/A	U	COMMENT
CF-1 Industrial Storage Racks. HR-LMH; LS-MH; PR-MH.	Industrial storage racks or pallet racks more than 12 ft high meet the requirements of ANSI/RMI MH 16.1 as modified by ASCE 7, Chapter 15. (Tier 2: Sec. 13.8.1; Commentary: Sec. A.7.11.1)			X		Industrial storage racks or pallet racks not found.

CF-2 Tall Narrow Contents. HR-not required; LS-H; PR-MH.	Contents more than 6 ft (1.8 m) high with a height-to-depth or height-to-width ratio greater than 3-to-1 are anchored to the structure or to each other. (Tier 2: Sec. 13.8.2; Commentary: Sec. A.7.11.2)		X			Tall and narrow contents with a height more than 6 feet and a height-to-depth or height-to-width ratio greater than 3-to-1 should be anchored to the structure or to each other.
CF-3 Fall-Prone Contents. HR-not required; LS-H; PR-H.	Equipment, stored items, or other contents weighing more than 20 lb (9.1 kg) whose center of mass is more than 4 ft (1.2 m) above the adjacent floor level are braced or otherwise restrained. (Tier 2: Sec. 13.8.2; Commentary: Sec. A.7.11.3)		X			Equipment, stored items, or other contents weighing more than 20 lb whose center of mass is more than 4 ft above the adjacent floor level should be braced or otherwise restrained.
CF-4 Access Floors. HR-not required; LS-not required; PR-MH.	Access floors more than 9 in. (229 mm) high are braced. (Tier 2: Sec. 13.6.10; Commentary: Sec. A.7.11.4)			X		
CF-5 Equipment on Access Floors. HR-not required; LS-not required; PR-MH.	Equipment and other contents supported by access floor systems are anchored or braced to the structure independent of the access floor. (Tier 2: Sec. 13.7.7 13.6.10; Commentary: Sec. A.7.11.5)			X		
CF-6 Suspended Contents. HR-not required; LS-not required; PR-H.	Items suspended without lateral bracing are free to swing from or move with the structure from which they are suspended without damaging themselves or adjoining components. (Tier 2: Sec. 13.8.2; Commentary: Sec. A.7.11.6)			X		

Mechanical and Electrical Equipment

EVALUATION ITEM	EVALUATION STATEMENT	C	NC	N/A	U	COMMENT
ME-1 Fall-Prone Equipment. HR-not required; LS-H; PR-H.	Equipment weighing more than 20 lb (9.1 kg) whose center of mass is more than 4 ft (1.2 m) above the adjacent floor level, and which is not in-line equipment, is braced. (Tier 2: Sec. 13.7.1 13.7.7; Commentary: Sec. A.7.12.4)				X	Equipment weighing more than 20 lb whose center of mass is more than 4 ft above the adjacent floor level should be braced or otherwise restrained.
ME-2 In-Line Equipment. HR-not required; LS-H; PR-H.	Equipment installed in line with a duct or piping system, with an operating weight more than 75 lb (34.0 kg), is supported and laterally braced independent of the duct or piping system. (Tier 2: Sec. 13.7.1; Commentary: Sec. A.7.12.5)			X		No inline equipment found.

ME-3 Tall Narrow Equipment. HR-not required; LS-H; PR-MH.	Equipment more than 6 ft (1.8 m) high with a height-to-depth or height-to-width ratio greater than 3-to-1 is anchored to the floor slab or adjacent structural walls. (Tier 2: Sec. 13.7.1 13.7.7; Commentary: Sec. A.7.12.6)				X	Tall and narrow mechanical and electrical equipment not found, however tall and narrow contents with a height more than 6 feet and a height-to-depth or height-to-width ratio greater than 3-to-1 should be anchored to the structure or to each other.
ME-4 Mechanical Doors. HR-not required; LS-not required; PR-MH.	Mechanically operated doors are detailed to operate at a story drift ratio of 0.01. (Tier 2: Sec. 13.6.9; Commentary: Sec. A.7.12.7)			X		
ME-5 Suspended Equipment. HR-not required; LS-not required; PR-H.	Equipment suspended without lateral bracing is free to swing from or move with the structure from which it is suspended without damaging itself or adjoining components. (Tier 2: Sec. 13.7.1, 13.7.7; Commentary: Sec. A.7.12.8)			X		
ME-6 Vibration Isolators. HR-not required; LS-not required; PR-H.	Equipment mounted on vibration isolators is equipped with horizontal restraints or snubbers and with vertical restraints to resist overturning. (Tier 2: Sec. 13.7.1; Commentary: Sec. A.7.12.9)			X		
ME-7 Heavy Equipment. HR-not required; LS-not required; PR-H.	Floor supported or platform-supported equipment weighing more than 400 lb (181.4 kg) is anchored to the structure. (Tier 2: Sec. 13.7.1, 13.7.7; Commentary: Sec. A.7.12.10)			X		
ME-8 Electrical Equipment. HR-not required; LS-not required; PR-H.	Electrical equipment is laterally braced to the structure. (Tier 2: Sec. 13.7.7; Commentary: Sec. A.7.12.11)			X		
ME-9 Conduit Couplings. HR-not required; LS-not required; PR-H.	Conduit greater than 2.5 in. (64 mm) trade size that is attached to panels, cabinets, or other equipment and is subject to relative seismic displacement has flexible couplings or connections. (Tier 2: Sec. 13.7.8; Commentary: Sec. A.7.12.12)			X		

Piping

EVALUATION ITEM	EVALUATION STATEMENT	C	NC	N/A	U	COMMENT
PP-1 Flexible Couplings. HR-not required; LS-not required; PR-H.	Fluid and gas piping has flexible couplings. (Tier 2: Sec. 13.7.3, 13.7.5; Commentary: Sec. A.7.13.2)			X		
PP-2 Fluid and Gas Piping. HR-not required; LS-not required; PR-H.	Fluid and gas piping is anchored and braced to the structure to limit spills or leaks. (Tier 2: Sec. 13.7.3, 13.7.5; Commentary: Sec. A.7.13.4)			X		

PP-3 C-Clamps. HR-not required; LS-not required; PR-H.	One-sided C-clamps that support piping larger than 2.5 in. (64 mm) in diameter are restrained. (Tier 2: Sec. 13.7.3, 13.7.5; Commentary: Sec. A.7.13.5)			X		
PP-4 Piping Crossing Seismic Joints. HR-not required; LS-not required; PR-H.	Piping that crosses seismic joints or isolation planes or is connected to independent structures has couplings or other details to accommodate the relative seismic displacements. (Tier 2: Sec. 13.7.3, 13.7.5; Commentary: Sec. A.7.13.6)			X		

Ducts

EVALUATION ITEM	EVALUATION STATEMENT	C	NC	N/A	U	COMMENT
D-1 Duct Bracing. HR-not required; LS-not required; PR-H.	Rectangular ductwork larger than 6 ft2 (0.56 m2) in cross-sectional area and round ducts larger than 28 in. (711 mm) in diameter are braced. The maximum spacing of transverse bracing does not exceed 30 ft (9.2 m). The maximum spacing of longitudinal bracing does not exceed 60 ft (18.3 m). (Tier 2: Sec. 13.7.6; Commentary: Sec. A.7.14.2)			X		
D-2 Duct Support. HR-not required; LS-not required; PR-H.	Ducts are not supported by piping or electrical conduit. (Tier 2: Sec. 13.7.6; Commentary: Sec. A.7.14.3)			X		
D-3 Ducts Crossing Seismic Joints. HR-not required; LS-not required; PR-H.	Ducts that cross seismic joints or isolation planes or are connected to independent structures have couplings or other details to accommodate the relative seismic displacements. (Tier 2: Sec. 13.7.6; Commentary: Sec. A.7.14.4)			X		

Elevators

EVALUATION ITEM	EVALUATION STATEMENT	C	NC	N/A	U	COMMENT
EL-1 Retainer Guards. HR-not required; LS-H; PR-H.	Sheaves and drums have cable retainer guards. (Tier 2: Sec. 13.7.11; Commentary: Sec. A.7.16.1)			X		No elevators found.
EL-2 Retainer Plate. HR-not required; LS-H; PR-H.	A retainer plate is present at the top and bottom of both car and counterweight. (Tier 2: Sec. 13.7.11; Commentary: Sec. A.7.16.2)			X		No elevators found.
EL-3 Elevator Equipment. HR-not required; LS-not required; PR-H.	Equipment, piping, and other components that are part of the elevator system are anchored. (Tier 2: Sec. 13.7.11; Commentary: Sec. A.7.16.3)			X		
EL-4 Seismic Switch. HR-not required; LS-not required; PR-H.	Elevators capable of operating at speeds of 150 ft/min or faster are equipped with seismic switches that meet the requirements of ASME A17.1 or have trigger levels set to 20% of the acceleration of gravity at the base of the structure and 50% of the acceleration of gravity in other locations. (Tier 2: Sec. 13.7.11; Commentary: Sec. A.7.16.4)			X		
EL-5 Shaft Walls. HR-not required; LS-not required; PR-H.	Elevator shaft walls are anchored and reinforced to prevent toppling into the shaft during strong shaking. (Tier 2: Sec. 13.7.11; Commentary: Sec. A.7.16.5)			X		

EL-6 Counterweight Rails. HR-not required; LS-not required; PR-H.	All counterweight rails and divider beams are sized in accordance with ASME A17.1. (Tier 2: Sec. 13.7.11; Commentary: Sec. A.7.16.6)			X		
EL-7 Brackets. HR-not required; LS-not required; PR-H.	The brackets that tie the car rails and the counterweight rail to the structure are sized in accordance with ASME A17.1. (Tier 2: Sec. 13.7.11; Commentary: Sec. A.7.16.7)			X		
EL-8 Spreader Bracket. HR-not required; LS-not required; PR-H.	Spreader brackets are not used to resist seismic forces. (Tier 2: Sec. 13.7.11; Commentary: Sec. A.7.16.8)			X		
EL-9 Go-Slow Elevators. HR-not required; LS-not required; PR-H.	The building has a go-slow elevator system. (Tier 2: Sec. 13.7.11; Commentary: Sec. A.7.16.9)			X		

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Appendix B: Concept-Level Seismic Upgrade Figures

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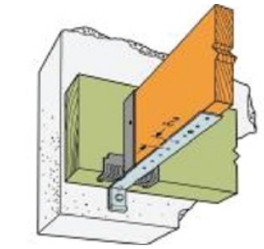
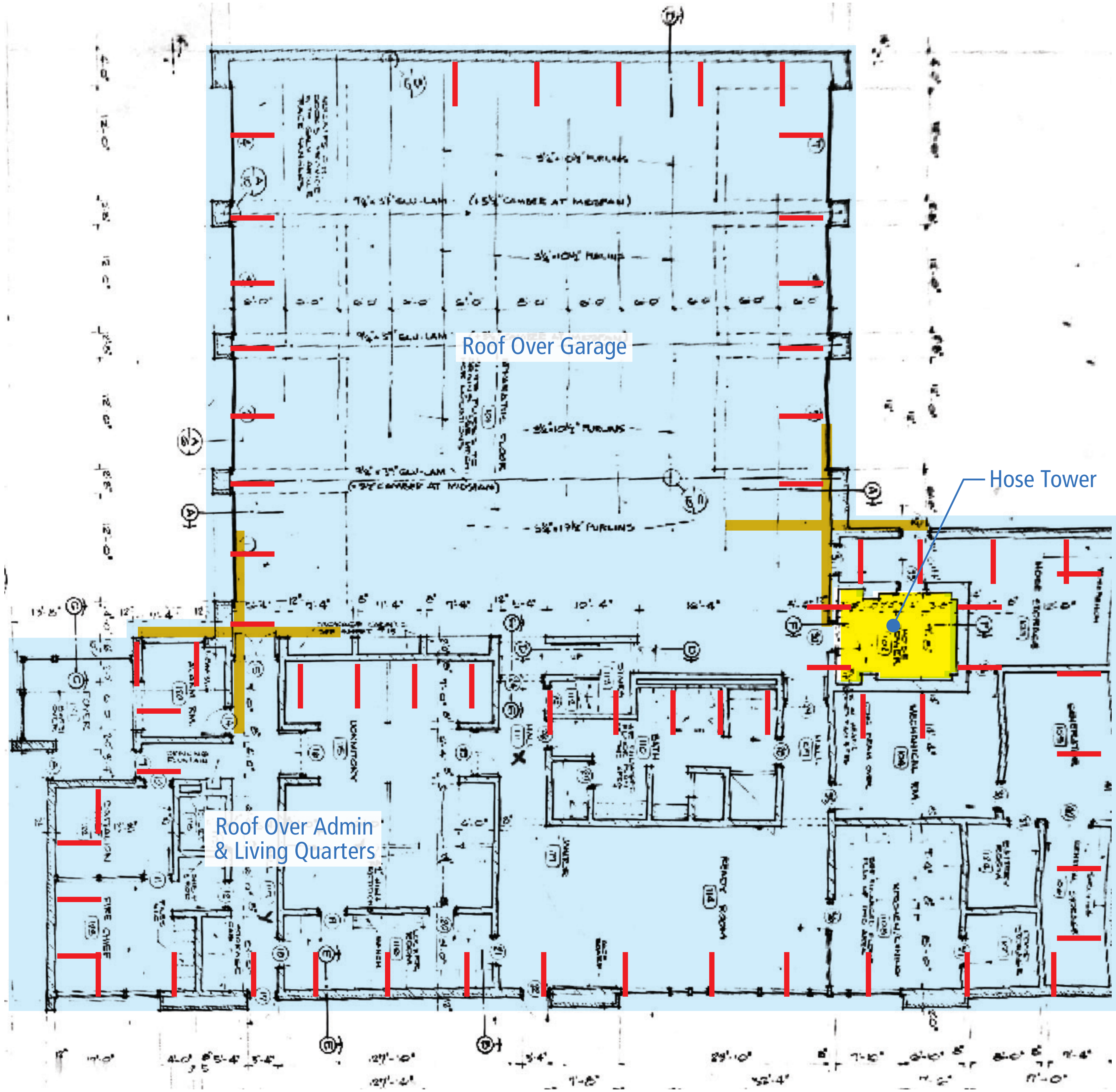
PHASE **2**

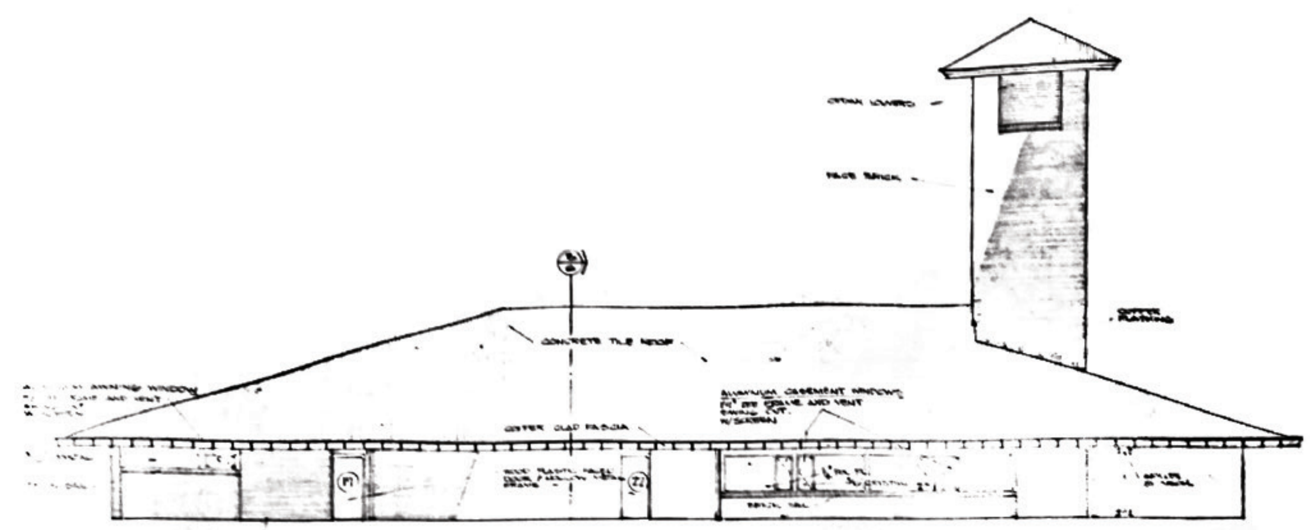
LEGEND

- Install New Wood Structural Panel Roof Sheathing At Entire Roof Area, Remove & Replace Roofing
  Approximate Area: 13,597 Square Feet (Area Transformed By Pitch Of Roof)
- Install New Steel Bracing Frame At Interior Of Hose Tower, Assume A36 Steel Angles Bracing Opposite Faces Of The Tower Walls In X-Bracing Pattern, Refer To Figure 2
  Assumed 2,000lb Steel Total
- Install New 15' Long 14 Gauge Steel Strap Over Roof Diaphragm, With 2x Wood Blocking Underneath; Center Strap At Vertex Of Reentrant Corner, Total Two Straps Per Vertex Oriented Perpendicular As Shown
- Install New Tension Ties, E.g. Simpson LTT, At 48" OC Around The Perimeter Of The Roof Between The New Diaphragm & Walls
  Total Perimeter Length: 500 Feet
  Total Length At Interior Walls: 100 Ft
  Approximate Number Of Ties: 150 Ties





ROOF PLAN

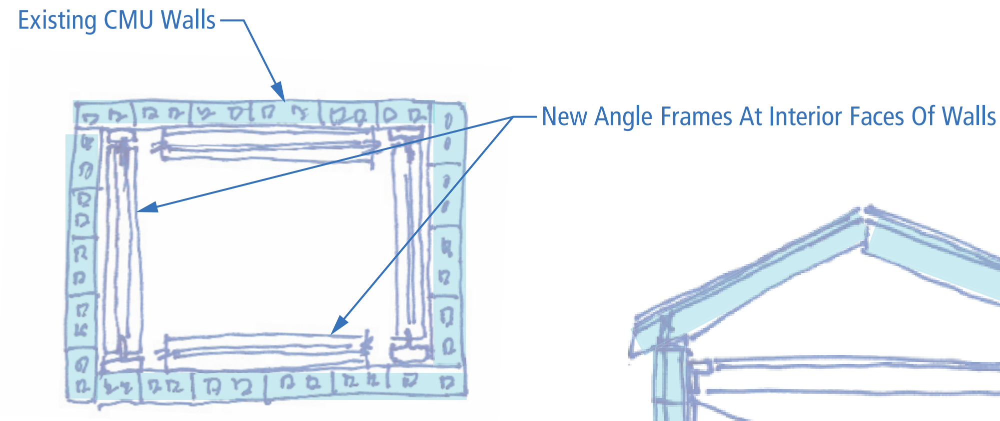


WEST ELEVATION

ReidMiddleton wsp

Hoquiam Fire Department Seismic Upgrades – 8th Street Station
Washington State School Seismic Safety Assessments Project – City of Hoquiam – June 2021

Figure 1 – Roof Plan



PLAN VIEW AT UPPER HOSE TOWER

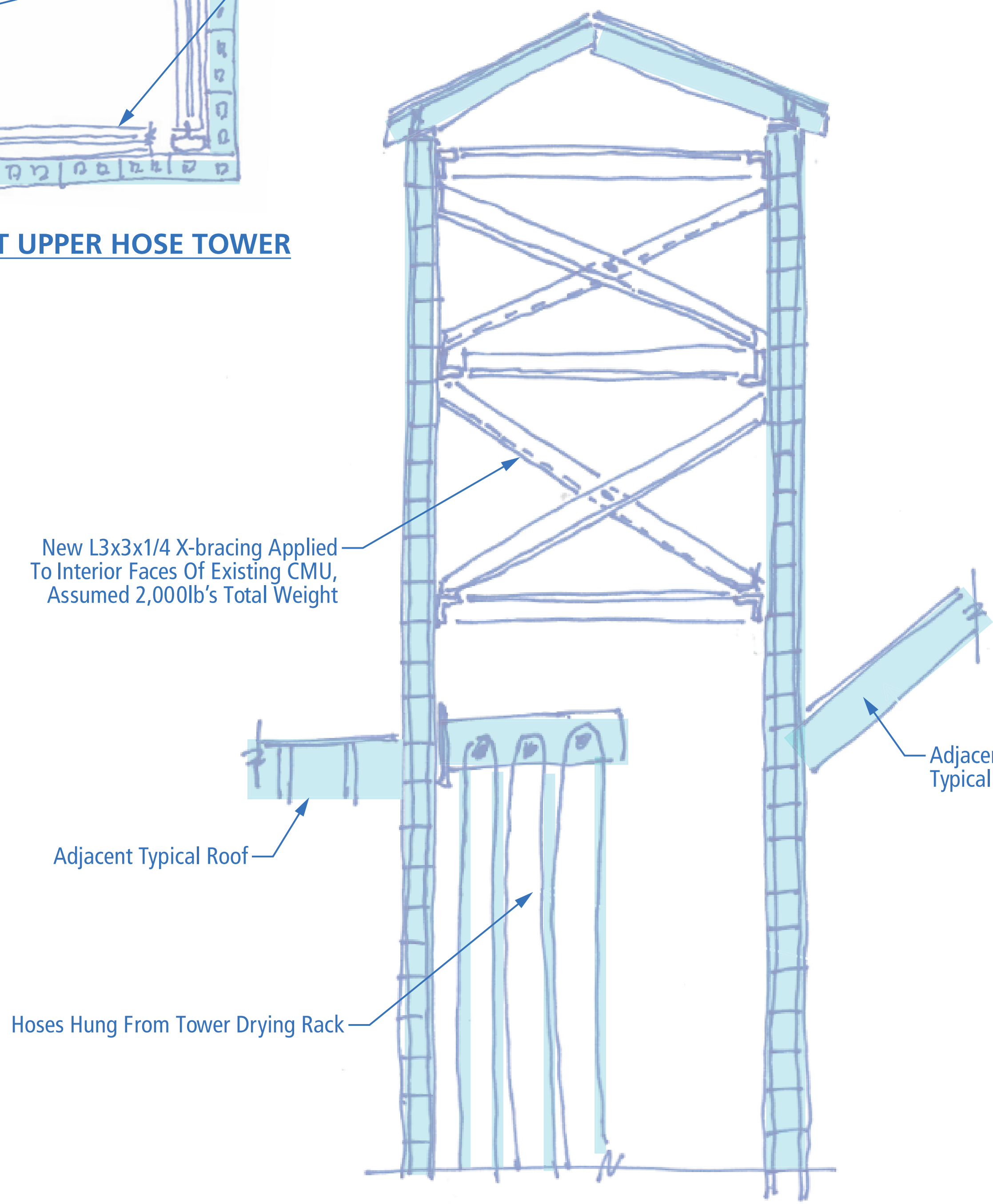


Figure 2 – Hose Tower Section

Appendix C: Opinion of Probable Construction Costs

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PRODIMS PROJECT MANAGEMENT SERVICES

520 Kirkland Way, Suite 301
Kirkland, WA 98033
tel: (425) 828-0500
fax: (425) 828-0700
www.prodims.com

Name:	Wa State School Seismic Safety Assessment Phase 2
Second Name:	Hoquiam Fire Station - 8th Street
Location:	Hoquiam, WA
Design Phase:	ROM Cost Estimates
Date of Estimate:	March 13, 2021
Date of Revision:	April 9, 2021
Month of Cost Basis:	1Q, 2021

Hoquiam Fire Station - 8th Street

Master Estimate Summary

Project Name	Construction Cost Type	Estimated Construction Cost
Hoquiam Fire Station - 8th Street	Structural Costs	$712,286
Hoquiam Fire Station - 8th Street	Non-Structural Costs	$427,372
TOTAL ESTIMATED CONSTRUCTION COST →		**$1,139,657**

Soft Costs	Soft Costs % Construction Cost	Estimated Soft Costs
Project Soft Cost Allowance	39.0%	**$444,466**
		Sum of the Above
TOTAL ESTIMATED PROJECT COST →		**$1,584,124**

Estimate Assumptions:

The ROM Construction Cost estimates are based on the Concept Design Report for the Project.
Construction Escalation is not included. Costs are current as of the month of Cost Basis noted above right.

Estimate Qualifications:

The ROM estimates are not be relied on solely for proforma development and financial decisions.
Further design work is required to determine construction budgets.
All Buildings Estimated to the 5' foot line for Utilities, All Sitework is estimated to go with any combination of the buildings and alternatives.
The ROM estimates do not include any Hazardous Material Abatement/Disposal.
For Construction Cost Markups they are additive, not cumulative. Percentages are added to the previous subtotal rather than the direct cost subtotal.
Owner Soft Costs Allowance are: A/E design fees, QA/QC, Project Administration, Owners Project Contingency, Average Washington State Sale Tax and
Estimated labor is based on an 8 hour per day shift 5 days a week. Accelerated schedule work of overtime has not been included.
Estimated labor is based on working on unoccupied facility without phased construction.
Estimate is based on a competitive public bid with at least 3 bona fide submitted and unrescinded general contractor bids.
Estimate is based on a competitive public bid with a minimum 6 week bidding schedule and no significant addendums within 2 weeks of bid opening.
State of Washington General Contractor/ Construction Manager (GC/CM) contracts typically raises construction costs. It is Not Included in this estimate.
Estimated construction cost is for the entire project. This estimate is not intended to be used for other projects.
Please consult the cost estimator for any modifications to this estimate. Unilaterally adding and deleting markups, scope of work, schedule, specifications, plans and bid forms could incorrectly restate the project construction cost.
Construction reserve contingency for change orders is not included in the estimate.
Sole source supply of materials and/ or installers typically results in a 40% to 100% premium on costs over open specifications.

PRODIMS

Structural Costs

520 Kirkland Way, Suite 301
Kirkland, WA 98033
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Name: Wa State School Seismic Safety Assessment Phase 2
Second Name: Hoquiam Fire Station - 8th Street
Location: Hoquiam, WA
Design Phase: ROM Cost Estimates
Date of Estimate: March 13, 2021
Date of Revision: April 9, 2021
Month of Cost Basis: 1Q, 2021

Areas	sqft
Building Area	12,900
Total Areas	12,900

Hoquiam Fire Station - 8th Street

Construction Cost Estimate

Subtotal Direct Cost From the Estimate Detail Below $ 483,917

	Percentage of Previous Subtotal		Amount		Running Subtotal
Scope Contingency	10.0%	$	48,392	$	532,309
General Conditions	10.0%	$	48,392	$	580,701
Home Office Overhead	5.0%	$	24,196	$	604,897
Profit	6.0%	$	29,035	$	633,932
Escalation Not Included-Costs in 1Q, 2021 Dollars	12.4%	$	78,354	$	712,286
Washington State Sales Tax - Included in Soft Costs					

Total Markups Applied to the Direct Cost 47.19%
Markups are multiplied on each subtotal- They are not multiplied from the direct cost

			$/sqft
TOTAL ESTIMATED CONSTRUCTION COST--	**$**	**712,286**	**$ 55.22**
-20% TOTAL ESTIMATED CONSTRUCTION COST VARIANCE --	**$**	**569,829**	**$ 44.17**
+50% TOTAL ESTIMATED CONSTRUCTION COST VARIANCE --	**$**	**1,068,429**	**$ 82.82**

Please see the Master Summary for Assumptions and Qualifications for ROM Cost Estimates

Direct Cost of Construction

WBS	Description	Quantity	U of M	Labor	Labor Total	Material	Material Total	Equipment	Equipment Total	Total $/U of M	Direct Cost
1 - Seismic Retrofit											
Superstructure											
Roof Systems											
	Structural Steel Angles at Tower Walls	1	ton	$ 7,350.00	$ 7,350.00	$ 3,150.00	$ 3,150.00	$ 630.00	$ 630.00	$ 11,130.00	$ 11,130.00
	CMSTC14 Nailed to Sheathing with 2X Blocking	60	lnft	$ 10.40	$ 624.00	$ 5.60	$ 336.00	$ 0.96	$ 57.60	$ 16.96	$ 1,017.60
	Add 1/2" Plywood Sheathing at Existing Roof	13,597	sqft	$ 0.94	$ 12,815.17	$ 0.51	$ 6,900.48	$ 0.09	$ 1,182.94	$ 1.54	$ 20,898.59
	Wall to Joist Anchorage - Allow a LTT with Nails to Joist with 5/8" Dia Epoxy Anchor Bolt with Nut and Washer	150	each	$ 210.80	$ 31,620.00	$ 99.20	$ 14,880.00	$ 18.60	$ 2,790.00	$ 328.60	$ 49,290.00
Roofing System											
	Remove Roofing System Down to Plywood Deck	13,597	sqft	$ 4.04	$ 54,897.89	$ 0.21	$ 2,889.36	$ 0.26	$ 3,467.24	$ 4.51	$ 61,254.49
	New Sloped Roofing System with R-38 Rigid Insulation, Flashing and Trim and Downspout Roof Drainage System	13,597	sqft	$ 8.78	$ 119,313.68	$ 10.73	$ 145,827.83	$ 1.17	$ 15,908.49	$ 20.67	$ 281,049.99
Interior Wall/Door/Casework/Specialties Systems											
	Remove and Reinstall Floor Finish Systems-Allow 10% of the Floor Area	1,290	sqft	$ 3.01	$ 3,879.03	$ 1.84	$ 2,377.47	$ 0.29	$ 375.39	$ 5.14	$ 6,631.89
	Remove and Reinstall Wall Finish Systems-Allow 10% of the Floor Area	1,290	sqft	$ 2.79	$ 3,599.10	$ 1.71	$ 2,205.90	$ 0.27	$ 348.30	$ 4.77	$ 6,153.30
	Remove Ceiling and Reinstall New ACT Ceiling Systems-Allow 50% of the Floor Area	6,450	sqft	$ 4.22	$ 27,193.20	$ 2.58	$ 16,666.80	$ 0.41	$ 2,631.60	$ 7.21	$ 46,491.60
Subtotal of the Direct Cost of Construction				**Hoquiam Fire Station - 8th Street**							**$ 483,917**

PRODIMS

520 Kirkland Way, Suite 301
Kirkland, WA 98033
Phone: 425-828-0500 Fax: 425-828-0700
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Non-Structural Costs

Name:	Wa State School Seismic Safety Assessment Phase 2
Second Name:	Hoquiam Fire Station - 8th Street
Location:	Hoquiam, WA
Design Phase:	ROM Cost Estimates
Date of Estimate:	March 13, 2021
Date of Revision:	April 9, 2021
Month of Cost Basis:	1Q, 2021

Areas	sqft
Building Area	12,900
Total Areas	12,900

Hoquiam Fire Station - 8th Street

Construction Cost Estimate

Subtotal Direct Cost From the Estimate Detail Below $ 290,350

	Percentage of Previous Subtotal	Amount	Running Subtotal
Scope Contingency	10.0%	$ 29,035	$ 319,386
General Conditions	10.0%	$ 29,035	$ 348,421
Home Office Overhead	5.0%	$ 14,518	$ 362,938
Profit	6.0%	$ 17,421	$ 380,359
Escalation Not Included-Costs in 1Q, 2021 Dollars	12.4%	$ 47,012	$ 427,372
Washington State Sales Tax - Included in Soft Costs			

Total Markups Applied to the Direct Cost 47.19%
Markups are multiplied on each subtotal- They are not multiplied from the direct cost

		$/sqft
TOTAL ESTIMATED CONSTRUCTION COST--→	**$ 427,372**	**$ 33.13**
-20% TOTAL ESTIMATED CONSTRUCTION COST VARIANCE --→	**$ 341,897**	**$ 26.50**
+50% TOTAL ESTIMATED CONSTRUCTION COST VARIANCE --→	**$ 641,057**	**$ 49.69**

Please see the Master Summary for Assumptions and Qualifications for ROM Cost Estimates

Direct Cost of Construction

WBS	Description	Quantity	U of M	Labor	Labor Total	Material	Material Total	Equipment	Equipment Total	Total $/U of M	Direct Cost
2- Non- Structural Demo/Restoration*											
M/E/P/FP systems											
	Mechanical/Electrical/Fire Protection Systems *	12,900	sqft	$ 11.68	$ 150,653.55	$ 9.56	$ 123,261.99	$ 1.27	$ 16,434.93	$ 22.51	$ 290,350.47

*Allows 60 percent of existing nonstructural systems M/E/P/FP require upgrades/replacement.

Subtotal of the Direct Cost of Construction	**Hoquiam Fire Station - 8th Street**	**$ 290,350**

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Appendix D: Not Used

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Appendix E: Existing Drawings

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New Eastside Fire Station
City of Hoquiam
Hoquiam, Washington

PROJECT INFORMATION

PROPERTY DESCRIPTION
LEGAL DESCRIPTION:
LOT 16, LESS NORTHERLY (5) FEET, LOTS 17, 18 & 19 IN BLOCK 50 OF ONTARIO ADDITION, CITY OF HOQUIAM, SITUATE IN THE COUNTY OF GRAYS HARBOR, STATE OF WASHINGTON
PARCEL NUMBER: 056205001700
SITE ADDRESS: 617 ONTARIO STREET, HOQUIAM, WASHINGTON 98550

BUILDING CODE INFORMATION
THE FOLLOWING INTERNATIONAL BUILDING CODE (IBC) 2009 & INTERNATIONAL FIRE CODE (IFC) 2009 SHALL BE THE BASIS FOR DESIGN:

OCCUPANCY:	B	GOVERNMENT BUILDINGS - FIRE STATION
CONSTRUCTION TYPE:	V-B	STRUCTURAL ELEMENTS, EXT. WALLS & INT. WALLS MAY BE OF ANY MATERIALS PERMITTED BY THIS CODE
AUTO. SPRINKLER SYSTEM:	YES	
FIRE ALARM SYSTEM:	NOT REQUIRED	

FIRE-RESISTANCE RATING:

STRUCTURAL FRAME:	0 HOURS
BEARING WALLS - INT:	0 HOURS
BEARING WALLS - EXT:	0 HOURS
NONBEAR. WALLS - INT:	0 HOURS
NONBEAR. WALLS - EXT:	0 HOURS
FLOOR CONSTRUCTION:	0 HOURS
ROOF CONSTRUCTION:	0 HOURS

ALLOWABLE BUILDING AREA:

TABLE 503 (PER FLOOR):		9,000 SF
SPRINKLER INCREASE (MULTISTORY)	= 100 %:	9,000 SF
FRONT. INCR. = (250/330-0.25) x 30/30	= 50 %:	4,500 SF
TOTAL AREA ALLOWED (PER FLOOR):		22,500 SF

TOTAL AREA ALLOWED: 22,500 SF x 2 (2-STORY) = 45,000 SF

PROPOSED BUILDING AREA:

MAIN LEVEL AREA:	3,940 SF
UPPER STORAGE AREA:	675 SF
TOTAL PROPOSED BUILDING AREA:	4,615 SF

ALLOWABLE BUILDING HEIGHT:

TABLE 503:	40 FT	2 STORIES
SPRINKLER INCREASE:	20 FT	1 STORY
TOTAL HEIGHT ALLOWED:	60 FT	3 STORIES

PROPOSED BUILDING HEIGHT: 24 FT 2 STORIES

OCCUPANCY SEPARATION: NONE REQUIRED

OCCUPANT LOAD: 7

SPACE	LOAD FACTOR	AREA	OCCUPANTS
RESIDENTIAL	200 SF/PERSON	1,220 SF	6.1

LOAD CRITERIA:

ASSUMED SOIL BEARING:	SEE GEOTECHNICAL REPORT - LANDAU ASSOCIATES	
FOOTING FREEZE DEPTH:	12 INCHES	
SEISMIC ZONE:	[illegible]	
WIND SPEED - EXPOSURE:	105 MPH - B	
GRAVITY LOADS:	UNIFORM	CONCENTRATED
GROUND SNOW LOAD:	25 PSF	25 PSF
FIRE APPARATUS:	[illegible] PSF	2,000 POUNDS
SUPPORT SPACES:	[illegible] PSF	2,000 POUNDS
STORAGE:	125 PSF	1,000 POUNDS

ZONING ORDINANCE INFORMATION

ZONING DISTRICT:	C-1: GENERAL COMMERCIAL DISTRICT
USE CLASS:	COMMUNITY FACILITY (FIRE STATION) IS A PERMITTED USE
LOT SIZE:	10,700 SQUARE FEET
REQUIRED PARKING:	[illegible]
PROVIDED PARKING:	(7) SPACES

EXISTING CONDITIONS
THE DRAWINGS CONTAIN REFERENCE TO EXISTING SITE CONDITIONS. THE CONTRACTOR SHALL VERIFY ALL EXISTING CONDITIONS & DIMENSIONS. SUBMITTING A BID SHALL INDICATE THE CONTRACTOR'S ACCEPTANCE OF THE EXISTING CONDITIONS & WILLINGNESS TO PROVIDE LABOR, MATERIALS & EQUIPMENT NECESSARY TO COMPLETE THE WORK INTENDED BY THE CONTRACT DRAWINGS.

GENERAL NOTES
THESE GENERAL NOTES ARE TO BE USED AS A SUPPLEMENT TO THE SPECIFICATIONS. ANY DISCREPANCIES FOUND AMONG THE DRAWINGS, SPECIFICATIONS, THESE GENERAL NOTES & SITE CONDITIONS SHALL BE REPORTED TO THE ARCHITECT, WHO SHALL CORRECT SUCH DISCREPANCY IN WRITING. ANY WORK DONE BY THE CONTRACTOR AFTER DISCOVERY OF SUCH DISCREPANCY SHALL BE DONE AT THE CONTRACTOR'S RISK. THE CONTRACTOR SHALL VERIFY AND COORDINATE DIMENSIONS AMONG ALL DRAWINGS PRIOR TO PROCEEDING WITH ANY WORK OR FABRICATION.
STABILITY OF THE STRUCTURE PRIOR TO COMPLETION IS THE SOLE RESPONSIBILITY OF THE CONTRACTOR. THIS RESPONSIBILITY INCLUDES, BUT IS NOT LIMITED TO, JOBSITE SAFETY, ERECTION MEANS, METHODS, AND SEQUENCES, TEMPORARY SHORING, FORMWORK AND BRACING, USE OF EQUIPMENT AND CONSTRUCTION PROCEDURES.
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DEFERRED SUBMITTALS
MANUFACTURED ROOF TRUSSES SHOP DRAWING
AUTOMATIC FIRE SPRINKLER SYSTEM SHOP DRAWING
HVAC SYSTEM SHOP DRAWING
ELECTRICAL SYSTEM SHOP DRAWING

CONTACT INFORMATION

CITY OF HOQUIAM - ADMINISTRATION
BRIAN SHAY - CITY ADMINISTRATOR
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alan@harborarchitects.com

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gbeckner@pcs-structural.com

DRAWING INDEX

New Eastside Fire Station
City of Hoquiam
Hoquiam, Washington

Harbor Architects

New Eastside Fire Station
City of Hoquiam
Hoquiam, Washington

New Eastside Fire Station
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DRAWING INDEX

ET JULY 30, 1970

REN A.I.A. CONSULTANTS WASHINGTON	AUG. 5 1

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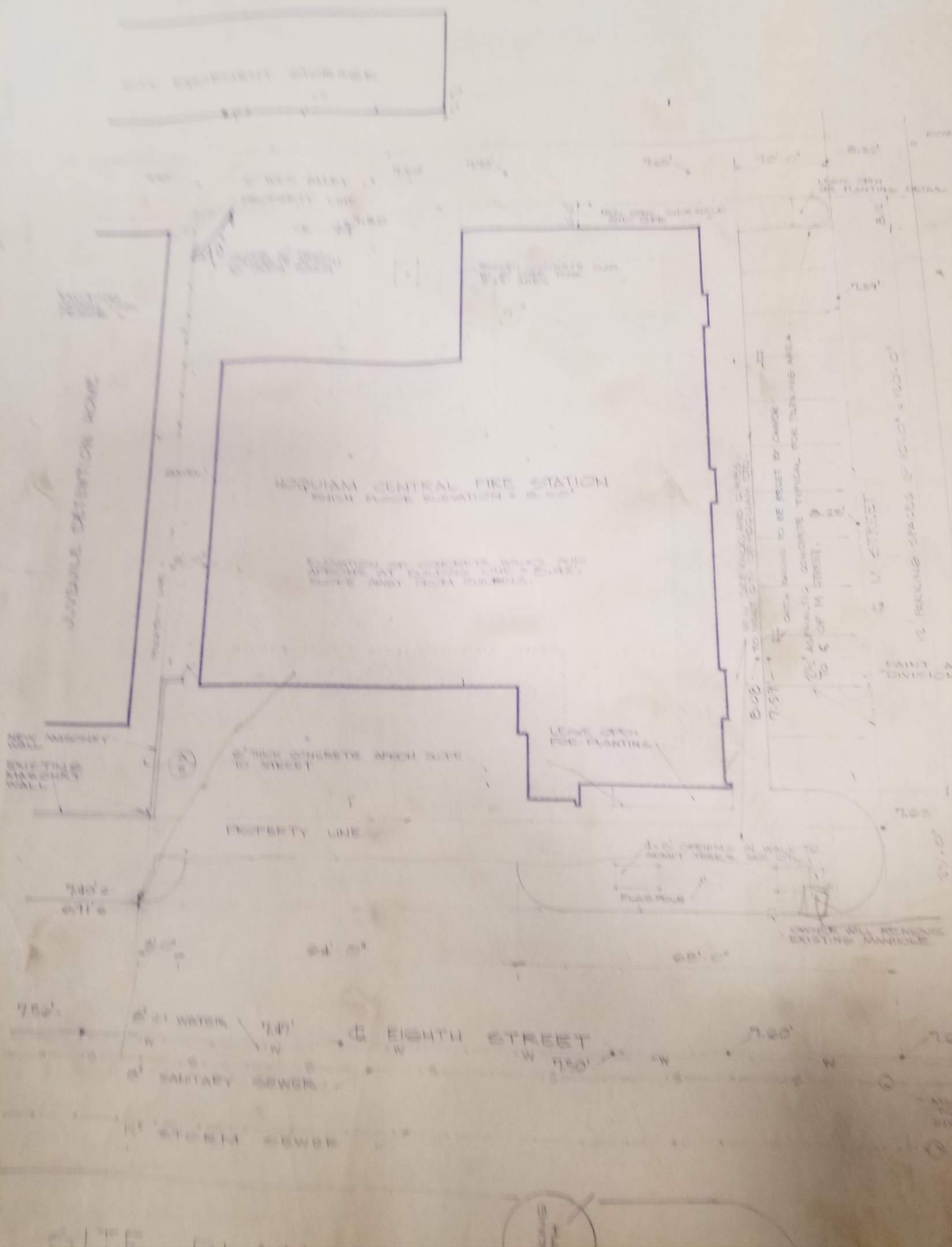
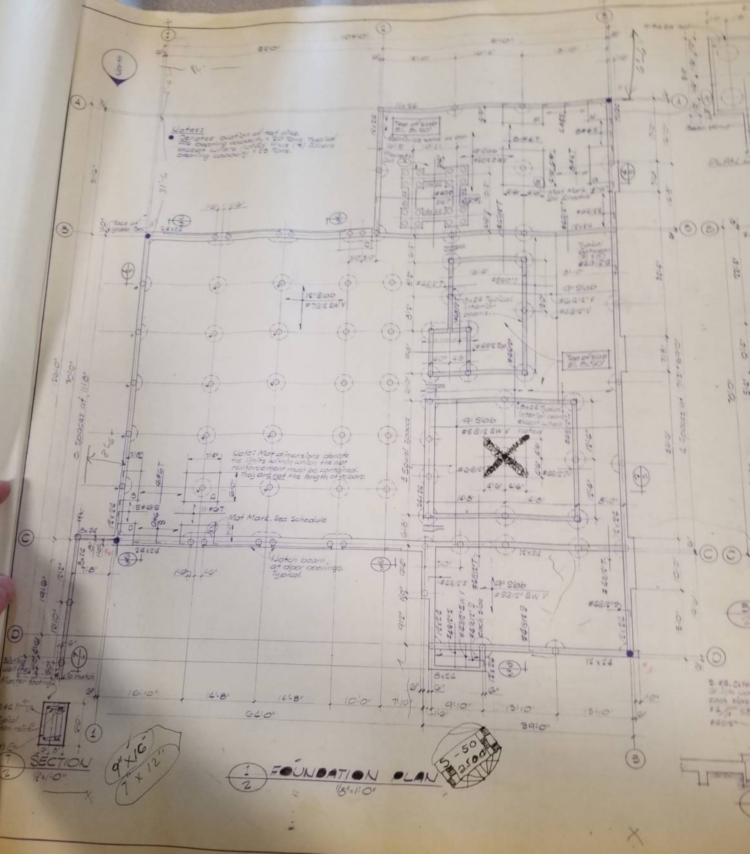
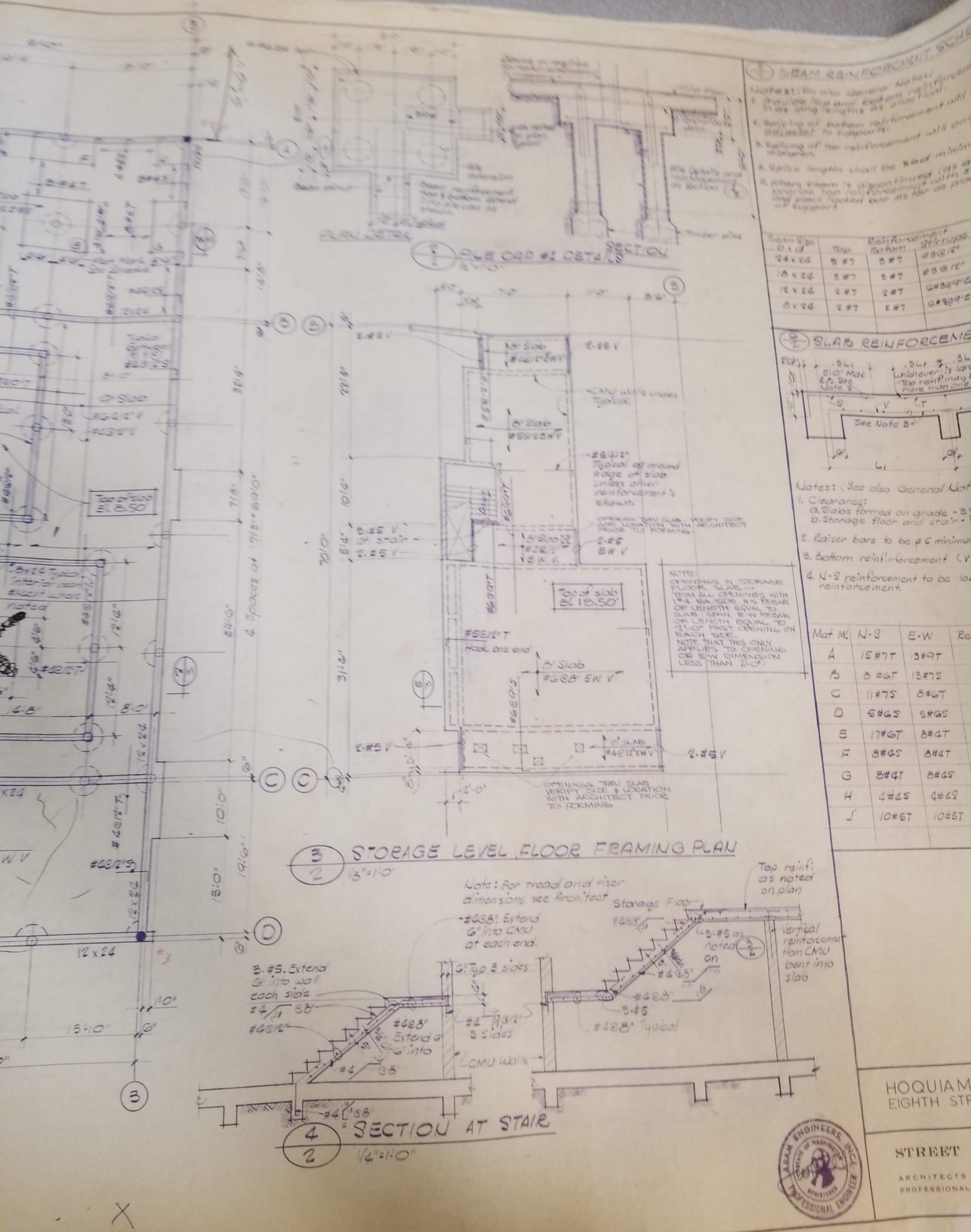


PROPERTY LINE
JUVENILE DETENTION HOME
HOQUIAM CENTRAL FIRE STATION
LEAVE OPEN FOR PLANTING
NEW MASONRY WALL
EXISTING MASONRY WALL
PROPERTY LINE
OWNER WILL REMOVE EXISTING MANHOLE
24' 5"
68' 6"
8" WATER
℄ EIGHTH STREET
8" SANITARY SEWER
STORM SEWER
℄ M STREET
8.08'
7.57'
8.25'
7.52'
7.47'
7.60'
7.50'

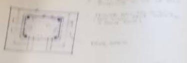


Notes:
Note: Mat dimensions denote the limits within which the mat reinforcement must be contained. They are not the length of the bars.
Mat Mark. See Schedule
Notch beam at door openings. Typical.
12" Slab
9" Slab
9" Slab
9" Slab
3 Equal Spaces
6 Spaces at 11'-8"
64'-0"
39'-0"
16'-10"
14'-8"
14'-8"
10'-0"
SECTION
FOUNDATION PLAN
1/8"=1'-0"
9"x16"
7"x12"
S-50

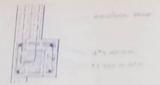


Beam Size b x d	Top	Bottom	Stirrups
24 x 24	3 #7	3 #7	#3 @ 12"
18 x 24	3 #7	3 #7	#3 @ 12"
12 x 24	2 #7	2 #7	
8 x 24	2 #7	2 #7	

Mat Mk	N-S	E-W
A	15#7T	13#9T
B	8#6T	13#7S
C	11#7S	8#6T
D	5#6S	5#6S
E	17#6T	8#4T
F	8#4S	8#4T
G	8#4T	8#4S
H	4#4S	4#4S
J	10#5T	10#5T

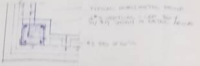


PILASTER @ OH DOORS

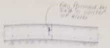


PILASTER @ HOSE TOWER

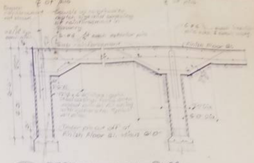
PILASTER & ARCH REINF



PILASTER @ HOSE TOWER



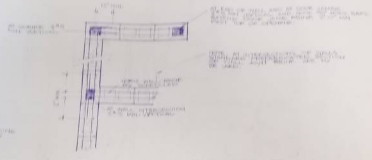
CONSTRUCTION JOINT DETAIL



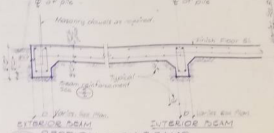
1/3 SECTION THRU SLAB

1/4"=1'-0"

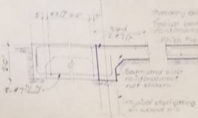
TYPICAL WALL REINFORCING



TYPICAL REINF. @ WALL INTERSECTIONS

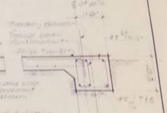


2/3 SECTION THRU BEAMS



3/3 SECTION THRU CANTILEVER BEAMS

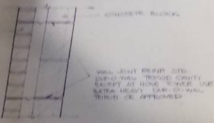
1/2"=1'-0"



4/3 LOCAL THICKENING ON ℄ 3

CONC. MASONRY REINF SCHEDULE

t	VERT.	HORIZ.	JOINT	REMARKS
6"	#4 @ 48"	2#4 @ 48"	@ 16" VERT.	
8"	#5 @ 48"	2#4 @ 48"	@ 16" VERT.	
12"	2#5 @ 48"	2#5 @ 48"	@ 16" VERT.	
14"	—		▶	COMBINATION OF 6" & 8" WALL
20"	—		▶	COMBINATION OF 12" & 8" WALL



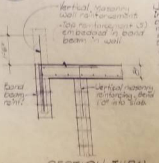
TYPICAL WALL JOINT REINF. FOR CAVITY WALLS

SCALE 1 1/2"=1'-0"

CONC. MASONRY LINTEL SCHEDULE

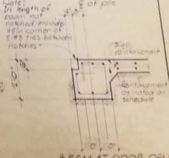
OP'G SIZE	LINTEL DEPTH	REINF. HORIZ.	STIRRUPS	REMARKS
≤ 4'-0"	8"	2#4 BOT.	—	ALL WALL t
4'<L≤7'	16"	2#5 TOP & BOT.	—	ALL WALL t

NOTE: LINTEL COURSE TO BE EXTENDED MIN. 2'-0" PAST OPENING AT EACH SIDE



5/3 SECTION THRU STORAGE FLOOR

1/2"=1'-0"



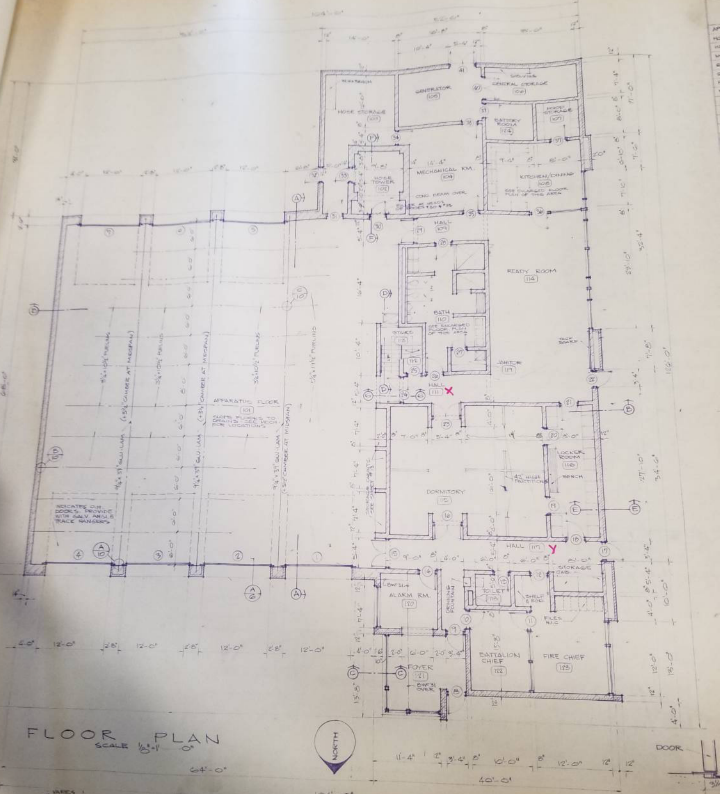
6/3 BEAM AT DOOR OPNGS OF APPARATUS ROOM

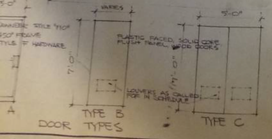
1/2"=1'-0"

HOQUIA
EIGHTH S

STREET

ARCHITEC
PROFESSION



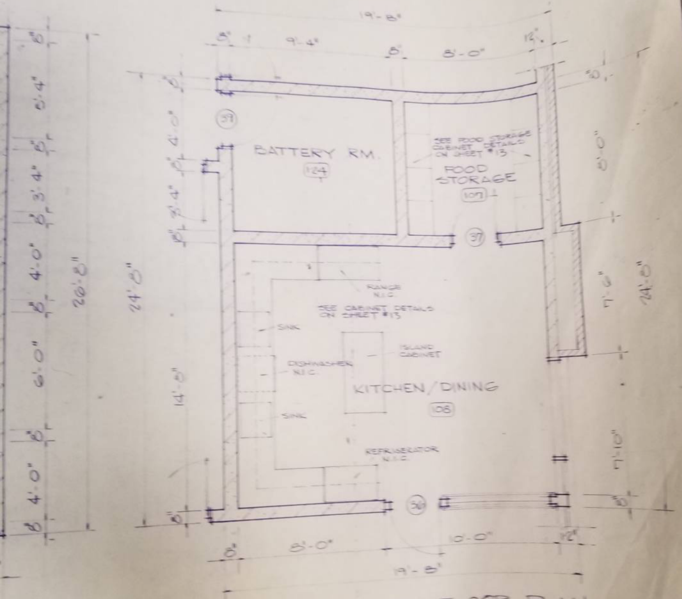


DOOR SCHEDULE

DOOR NUMBER	TYPE	SIZE	MAT.
1 THRU 7	O.H.	12'-0" x 12'-7 3/4"	ALUM.
8	A	3'-0" x 7'-2" x 1 3/4"	ALUM.
11 AND 36	B	3'-0" x 7'-0" x 1 3/4"	WOOD
13, 25 & 27	B	2'-8" x 7'-0" x 1 3/4"	WOOD
15, 16, 23, 24, 29, 40, 41 & 42	C	PAIR 2'-6" x 7'-0" x 1 3/4"	WOOD
9, 10, 12, 14, 17 THRU 22, 26, 28, 30 THRU 35, 37 THRU 39	B	3'-0" x 7'-0" x 1 3/4"	WOOD

THRESHOLD

S.A. - SUSPENDED ACOUSTICAL
G.B. - GYPSUM WALL BOARD



ENLARGED KITCHEN FLOOR PLAN
1/4"=1'-0"

HOQUIAM CENTRAL FIRE STATION
EIGHTH STREET AT M, HOQUIAM, WASHINGTON

STREET AND LUNDGREN A.I.A.

ARCHITECTS AND PLANNING CONSULTANTS
PROFESSIONAL BUILDING, ABERDEEN, - WASHINGTON

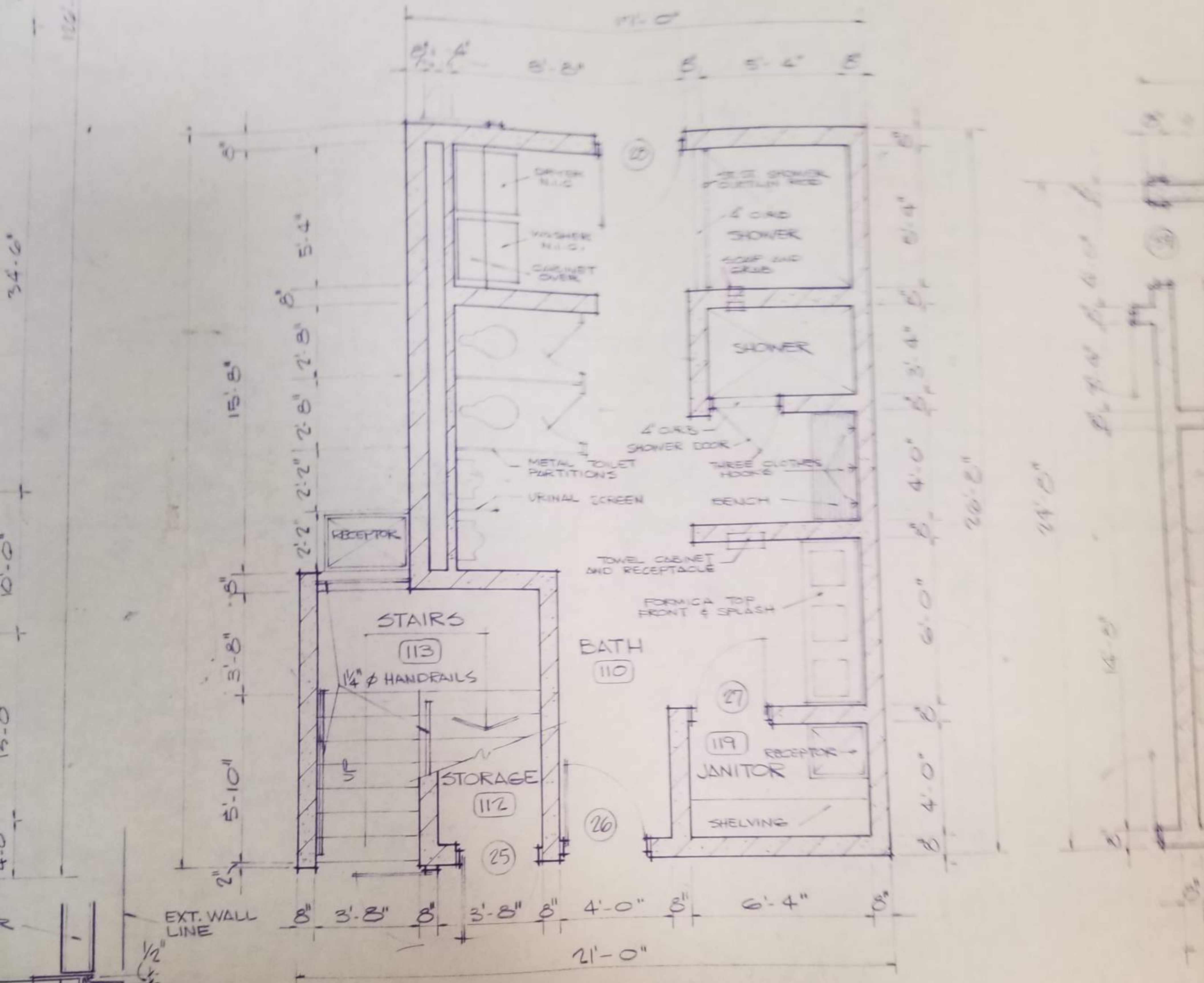
AUG 5, 1970

4
OF 15

V.A. - VINYL ASBESTOS FLOOR TILE
R. - RUBBER BASE
P. - PAINT
C.T. - CERAMIC TILE
BR. - BRICK

C.B. - CONCRETE BLOCK
C. - CONCRETE
R.D. - ROOF DECK
I.A. - IRON-ARMORED TOPPING
S.G. - SPECTRA-GLAZE

S. - STAIN
S.A. - SUSPENDED ACO
G.B. - GYPSUM WALL B

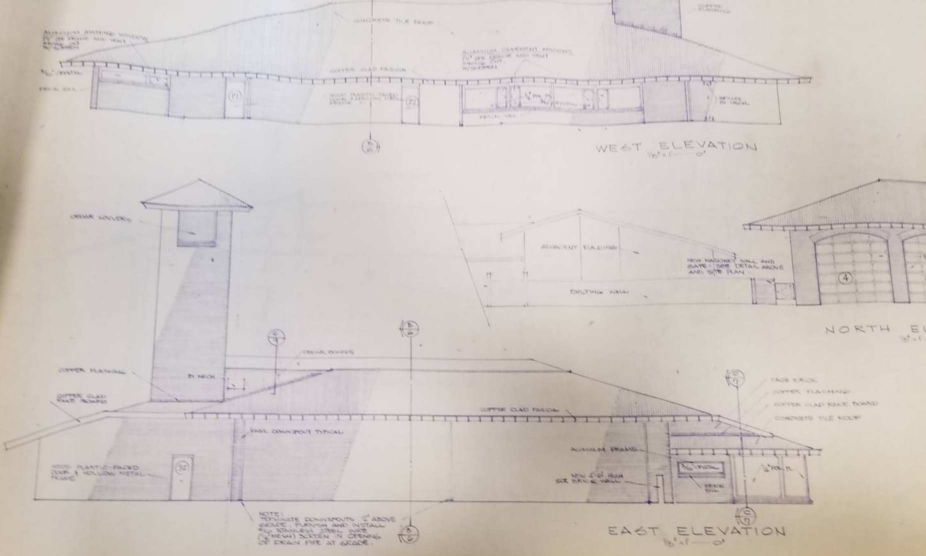


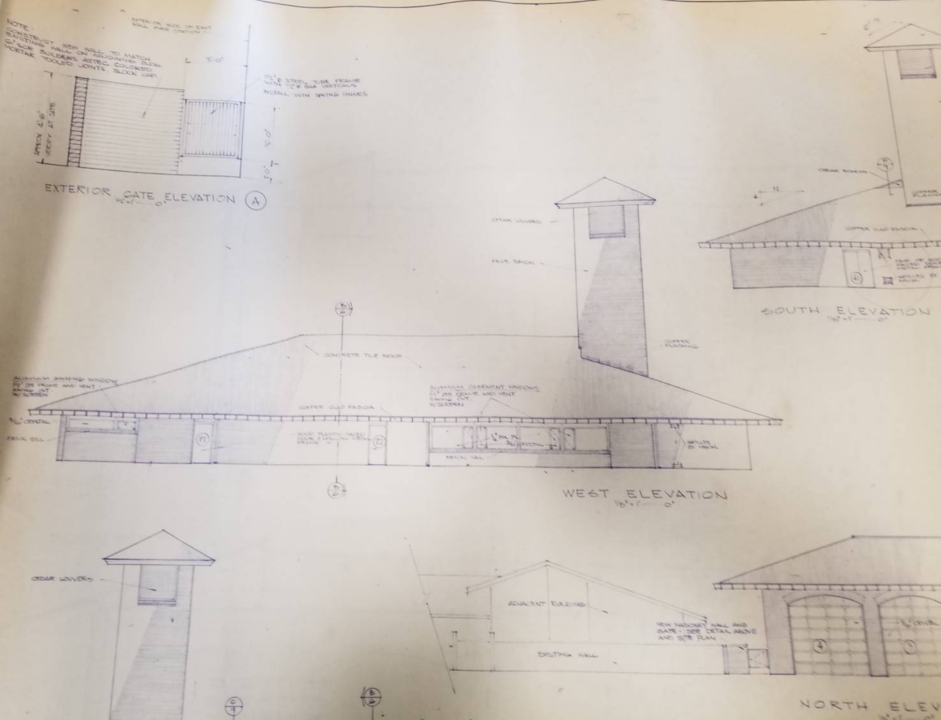
SHOLD DETAIL

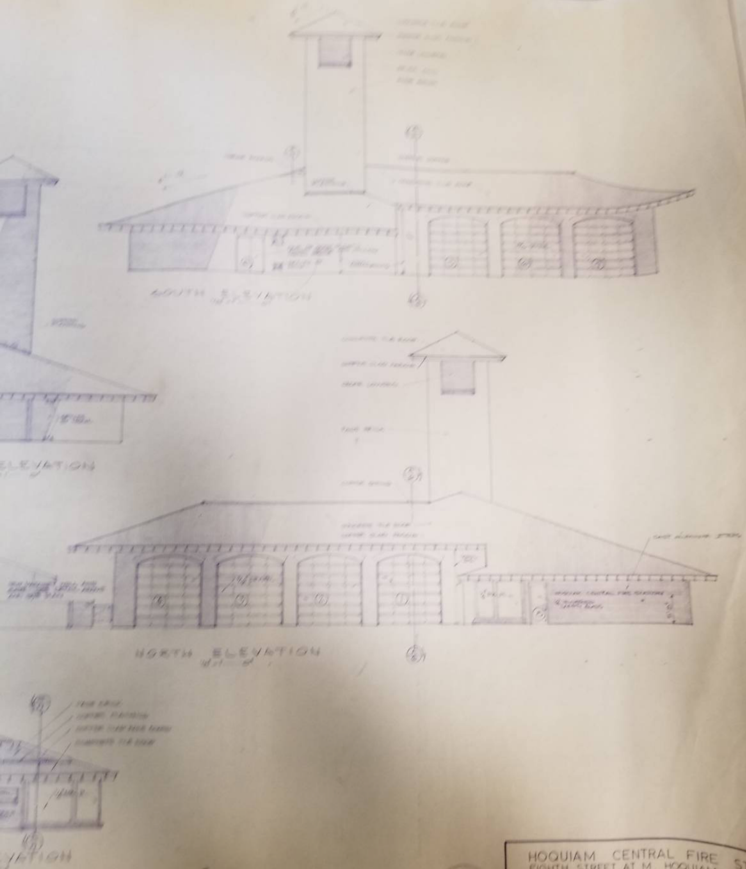
ENLARGED BATH AREA FLOOR PLAN
1/4" = 1'-0"

EN

	JAMB	REMARKS
A.	WOOD	SEE DOOR PAD DETAIL ON SHEET # 12. SEE SILL DETAIL ON SHEET # 6.
A.	ALUM.	PROVIDE CONCEALED OVERHEAD CLOSER.
D	WOOD	DOOR # 36 = 12x8 GRILLE
D	METAL	DOOR # 13 = 12x6 GRILLE
D	METAL	DOORS # 15, # 29 AND # 40 = 18x12 GRILLE IN EA. DOOR
D	METAL	DOORS # 19 & # 20 = 18x12 GRILLE, DOOR # 26 = 12x8 GRILLE DOOR # 28 = 12x8 GRILLE, DOOR # 39 = 12x6 GRILLE

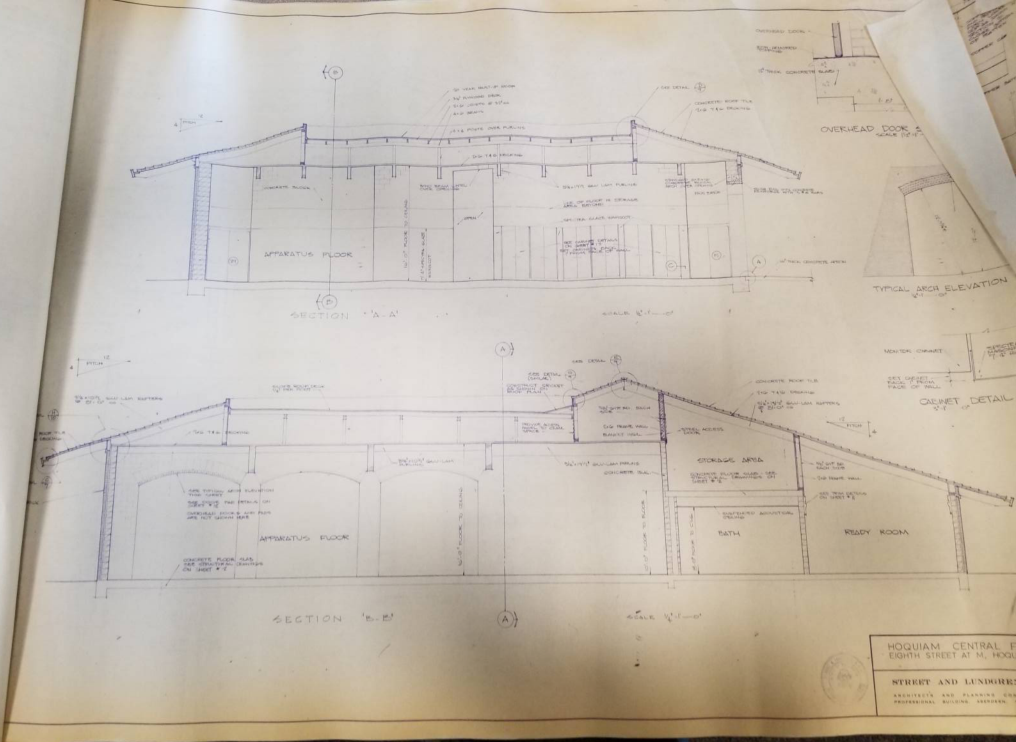

CONCRETE TILE ROOF
ALUMINUM CASEMENT WINDOWS
COPPER CLAD FASCIA
BRICK SILL
WEST ELEVATION
CEDAR LOUVERS
ADJACENT BUILDING
NEW MASONRY WALL AND GATE - SEE DETAIL ABOVE AND SITE PLAN
EXISTING WALL
CEDAR LOUVERS
COPPER FLASHING
COPPER CLAD RAKE BOARD
COPPER CLAD FASCIA
VINYL DOWNSPOUT TYPICAL
ALUMINUM FRAME
FACE BRICK
COPPER FLASHING
COPPER CLAD RAKE BOARD
CONCRETE TILE ROOF
NOTE:
TERMINATE DOWNSPOUTS 2" ABOVE GRADE. FURNISH AND INSTALL #14 STAINLESS STEEL WIRE (1/4" MESH) SCREEN IN OPENING OF DRAIN PIPE AT GRADE.
EAST ELEVATION


NOTE:
CONSTRUCT NEW WALL TO MATCH EXISTING WALL ON ADJOINING BLDG. 6" SCR BUILDERS AZTEC COLORED MORTAR TOOLED JOINTS. BLOCK CAP.
5'-0"
INSTALL WITH SPRING HINGES
EXTERIOR GATE ELEVATION
A
CEDAR LOUVERS
FACE BRICK
COPPER FLASHING
CONCRETE TILE ROOF
ALUMINUM AWNING WINDOW
COPPER CLAD FASCIA
ALUMINUM CASEMENT WINDOWS
BRICK SILL
WEST ELEVATION
SOUTH ELEVATION
CEDAR LOUVERS
ADJACENT BUILDING
NEW MASONRY WALL AND GATE - SEE DETAIL ABOVE AND SITE PLAN
EXISTING WALL
NORTH ELEV



HOQUIAM CENTRAL FIRE STAT
EIGHTH STREET AT M. HOQUIAM, WASHIN

STREET AND LUNDGREN A.I.A.
ARCHITECTS AND PLANNING CONSULTANTS
PROFESSIONAL BUILDING ABERDEEN WASHINGTO



SECTION 'A-A'
APPARATUS FLOOR
CONCRETE BLOCK
PITCH
SEE DETAIL
CONCRETE ROOF TILE
OPEN
SECTION 'B-B'
APPARATUS FLOOR
STORAGE AREA
BATH
READY ROOM
CONCRETE SILL
STEEL ACCESS DOOR
OVERHEAD DOOR
12" THICK CONCRETE SLAB
TYPICAL ARCH ELEVATION
MONITOR CABINET
CABINET DETAIL
HOQUIAM CENTRAL F
EIGHTH STREET AT M, HOQU
STREET AND LUNDGRE

3/8" PLATE - WELD
TO ANGLES

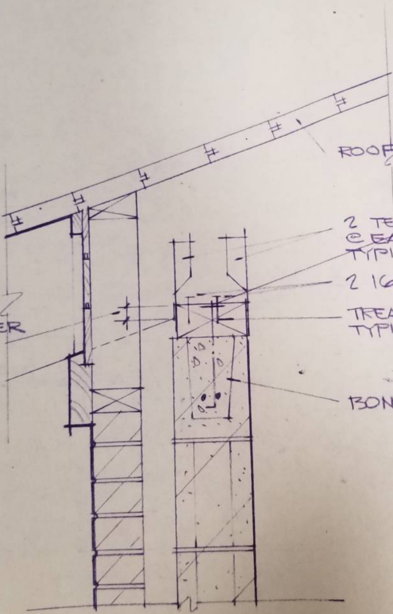
TREATED 2x6 PLATE
W/ 5/8" ϕ BOLTS @
48" CC

BOND

SECTION

NNECTION (F)
=1' — 0"

POST DETAIL
SCALE 3/4"=1' — 0"



ROO
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2
3
B

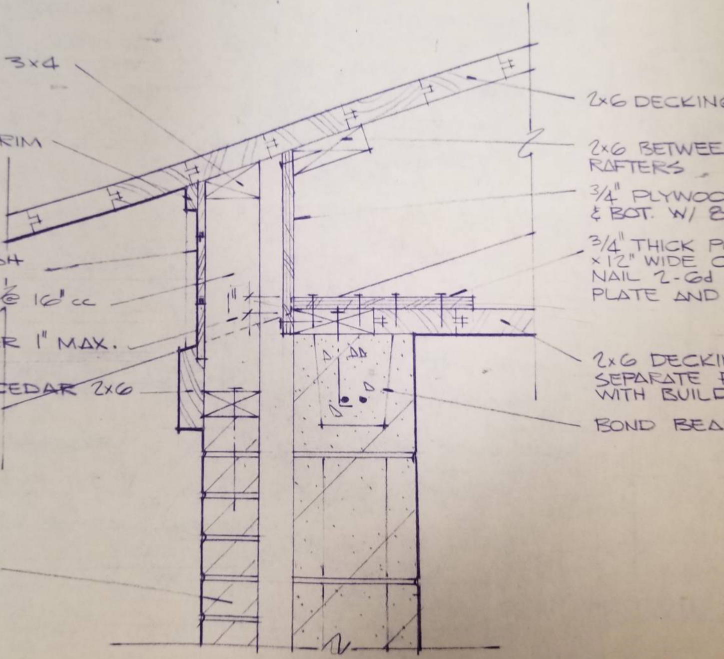
RAFTER BEARING DETAIL (J)
SCALE 1½"=1' — 0"

HO

ELEVATION ELEVA

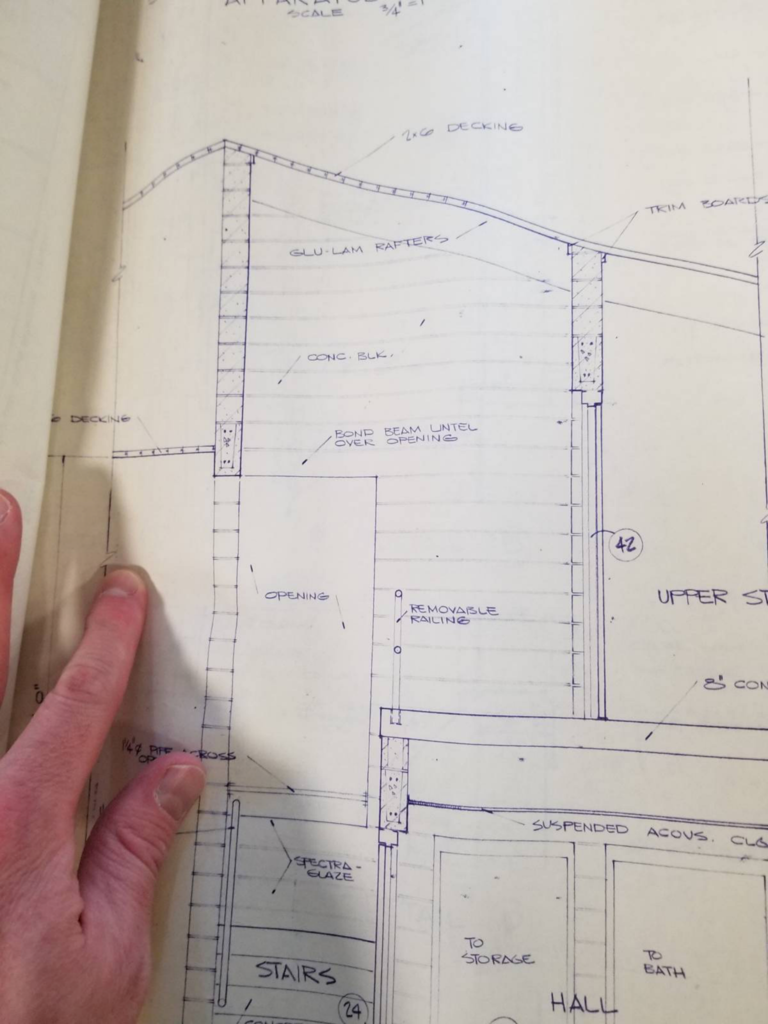
RAFTER CONNECTION (E) RAFTE

SCALE 1½"=1'—0"

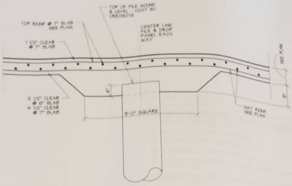


RAFTER BEARING DETAIL

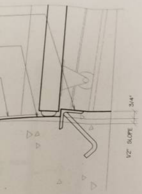
SCALE 1½"=1'—0"


SCALE 3/4" = 1'
2x6 DECKING
TRIM BOARDS
GLU-LAM RAFTERS
CONC. BLK.
DECKING
BOND BEAM LINTEL
OVER OPENING
42
UPPER ST
OPENING
REMOVABLE
RAILING
8" CON
SUSPENDED ACOUS. CLG
SPECTRA-
GLAZE
TO
STORAGE
TO
BATH
STAIRS
24
HALL

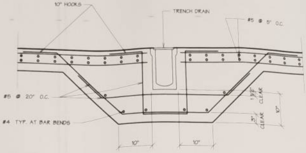
...ERIOR GRADE BEAM



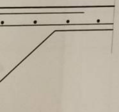
(3) TYPICAL AT STRUCTURAL SLAB DROP PANEL AT INTERIOR PILE
1" = 1' - 0"



...EAD DOOR

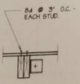


(6) TRENCH DRAIN
3" = 1' - 0"

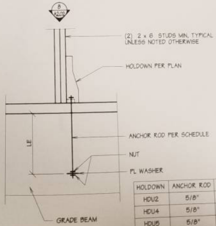


...S IN COMMON SEE 1/A2.01

...RADE BEAM



(8) DETAIL
1" = 1' - 0"



HOLDOWN	ANCHOR ROD	LE
HDU2	5/8"	10"
HDU4	5/8"	10"
HDU5	5/8"	10"
HDU8	7/8"	14"

TYP. HOLDOWN @ FDN. WALL
(9) DETAIL
1" = 1' - 0"

New Eastside Fire Station
City Of Hoquiam
Hoquaim, Washington

Harbor Architects
504 South F Street
Aberdeen WA 98520-4139
voice 360-532-0980
fax 360-532-0996
www.harborarchitects.com

PERMIT SET

REVISIONS

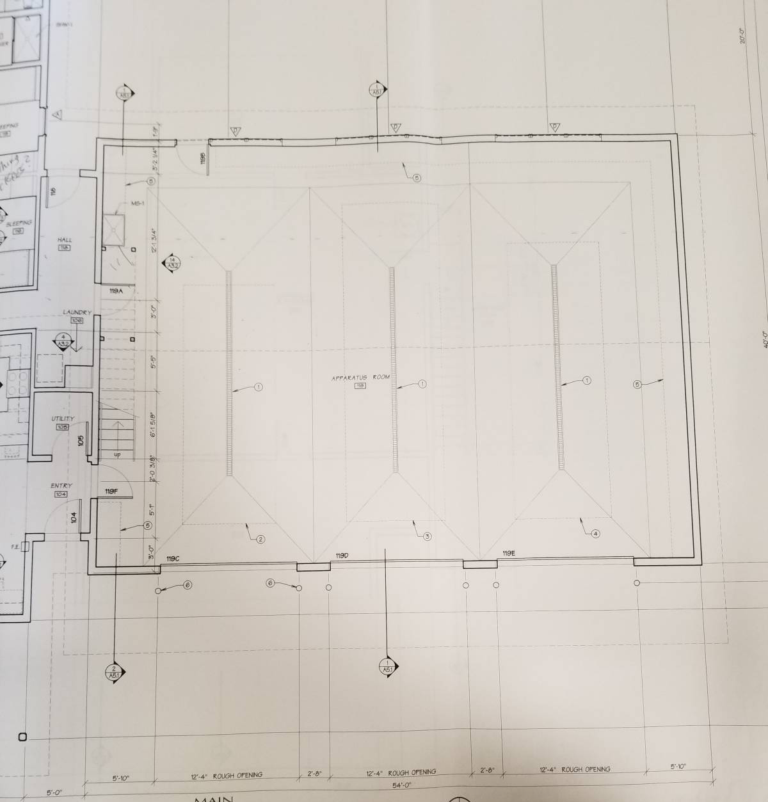
no	date	by
-	-	-

REGISTERED ARCHITECT
ALAN E. GOZART
STATE OF WASHINGTON

project number	12-35
date	6.25.13
file name	1235PSE2
drawn by	MFK
checked by	AEG
owner approval	

title
Foundation Details & Notes

A2.01



MAIN FLOOR PLAN

1/4" = 1'-0"

0 3 9 18

N

GENERAL NOTES

THESE GENERAL NOTES ARE TO BE USED AS A SUPPLEMENT TO THE SPECIFICATIONS. ANY DISCREPANCIES FOUND AMONG THE DRAWINGS, THE SPECIFICATIONS, THESE GENERAL NOTES AND THE SITE CONDITIONS SHALL BE REPORTED TO THE ARCHITECT, WHO SHALL CORRECT SUCH DISCREPANCY IN WRITING. ANY WORK DONE BY THE GENERAL CONTRACTOR AFTER DISCOVERY OF SUCH DISCREPANCY SHALL BE DONE AT THE GENERAL CONTRACTOR'S RISK. THE GENERAL CONTRACTOR SHALL VERIFY AND COORDINATE DIMENSIONS AMONG ALL DRAWINGS PRIOR TO PROCEEDING WITH ANY WORK OR FABRICATION. THE STRUCTURE HAS BEEN DESIGNED TO RESIST CODE REQUIRED VERTICAL AND LATERAL FORCES AFTER THE CONSTRUCTION OF ALL STRUCTURAL ELEMENTS HAS BEEN COMPLETED. STABILITY OF THE STRUCTURE PRIOR TO COMPLETION IS THE SOLE RESPONSIBILITY OF THE GENERAL CONTRACTOR. THIS RESPONSIBILITY INCLUDES BUT IS NOT LIMITED TO JOB SITE SAFETY; ERECTION MEANS, METHODS, AND SEQUENCES; TEMPORARY SHORING, FORMWORK, BRACING; USE OF EQUIPMENT AND CONSTRUCTION PROCEDURES. PROVIDE ADEQUATE RESISTANCE TO LOADS ON THE STRUCTURES DURING CONSTRUCTION PER SEI/ASCE STANDARD NO. 37-02 "DESIGN LOADS ON STRUCTURES DURING CONSTRUCTION."

CONSTRUCTION OBSERVATION BY THE STRUCTURAL ENGINEER IS FOR GENERAL CONFORMANCE WITH DESIGN ASPECTS ONLY AND IS NOT INTENDED IN ANY WAY TO REVIEW THE CONTRACTOR'S CONSTRUCTION PROCEDURES.

STANDARDS

ALL METHODS, MATERIALS AND WORKMANSHIP SHALL CONFORM TO THE 2012 ~~2009~~ INTERNATIONAL BUILDING CODE (IBC) AS AMENDED AND ADOPTED BY THE ~~LOCAL BUILDING OFFICIAL OR APPLICABLE JURISDICTION~~ CITY OF HOQUIAM.

DESIGN CRITERIA

VERTICAL LOADS

AREA	DESIGN DEAD LOAD	LIVE LOAD ~~(2)~~	~~PARTITION LOAD~~	~~CONCENTRATED LOADS~~
ROOF	20 PSF	25 PSF (1)		
~~MECHANICAL ROOM~~	~~20 PSF~~	~~25 PSF~~	~~EQUIPMENT~~	
FLOOR - HOUSING	10 ~~10~~ PSF	50 ~~100~~ PSF		~~2,000#~~
~~STAIRS~~ APPARATUS BAY	ACTUAL ~~20 PSF~~	250 ~~100~~ PSF OR VEHICLE INDICATED ON PLAN		~~300#~~

SNOW (1) DRIFT ~~AND UNBALANCED SNOW~~ LOAD ~~PER ASCE 7-05, CHAPTER 7.~~ NOT REQUIRED.
~~(2) LIVE LOADS EXCEPT SNOW LOADS ARE REDUCED PER IBC SECTION 1607.9.~~

LATERAL FORCES

LATERAL FORCES ARE TRANSMITTED BY DIAPHRAGM ACTION OF ROOF AND FLOORS TO ~~BRACED FRAME~~/SHEAR WALLS. LOADS ARE THEN TRANSFERRED TO FOUNDATION BY ~~BRACED FRAME~~/SHEAR WALL ACTION WHERE ULTIMATE DISPLACEMENT IS RESISTED BY PASSIVE PRESSURE OF EARTH AND/OR SLIDING FRICTION. OVERTURNING IS RESISTED BY DEAD LOAD OF THE STRUCTURE.

CONCRE
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WATER:

MAXIMU
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NATURA
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PUMP H
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NOTED

GENERAL NOTES

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DESIGN CRITERIA

VERTICAL LOADS:

AREA	DESIGN DEAD LOAD	LIVE LOAD		
ROOF	20 PSF	25 PSF (1)		
FLOOR - HOUSING	10 PSF	50 PSF		
APPARATUS BAY		250 PSF OR VEHICLE INDICATED ON PLAN		

SNOW (1) DRIFT LOAD NOT REQUIRED.

LATERAL FORCES:

LATERAL FORCES ARE TRANSMITTED BY DIAPHRAGM ACTION OF ROOF AND FLOORS TO /SHEAR WALLS. LOADS ARE THEN TRANSFERRED TO FOUNDATION BY SHEAR WALL ACTION WHERE ULTIMATE DISPLACEMENT IS RESISTED BY PASSIVE PRESSURE OF EARTH AND/OR SLIDING FRICTION. OVERTURNING IS RESISTED BY DEAD LOAD OF THE STRUCTURE.

WIND:
- EXPOSURE CATEGORY = B
- BASIC WIND SPEED, V_{ULT} = 138 MPH
RISK CATEGORY IV

SEISMIC: V = CsW

WHERE $C_S = \frac{S_{DS}}{\left(\frac{R}{I_E}\right)}$, WITH

SEISMIC IMPORTANCE FACTOR, I_E = 1.50
RISK CATEGORY: IV
SPECTRAL RESPONSE ACCELERATIONS S_S = 1.46 S_1 = 0.71
SITE CLASS PER TABLE 20.3-1 = D
DESIGN SPECTRAL RESPONSE ACCELERATIONS S_{DS} = 0.88 & S_{D1} = 1.13
SEISMIC DESIGN CATEGORY = D
RESPONSE MODIFICATION FACTOR PER TABLE 12.2-1, R = 6.5

PIPES, DUCTS AND MECHANICAL EQUIPMENT SUPPORTED OR BRACED FROM STRUCTURE. CONFORM TO SHEET METAL AND AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION, INC. PUBLICATION "SEISMIC RESTRAINT MANUAL: GUIDELINES FOR MECHANICAL SYSTEMS". SPRINKLER LINE ATTACHMENTS SHALL CONFORM TO NFPA PAMPHLET 13.

FOUNDATION DESIGN CRITERIA (REFER TO GEOTECHNICAL REPORT BY LANDAU & ASSOCIATES)

SOIL BEARING PRESSURE: 750 PSF*
PILE CAPACITY: 20 TONS
PASSIVE RESISTANCE: 100 PCF
COEFFICIENT OF FRICTION: 0.20
*1/3 INCREASE ALLOWED FOR SEISMIC OR WIND LOADING

ALL FOOTINGS SHALL BEAR ON "STRUCTURAL BACKFILL". "STRUCTURAL BACKFILL" SHALL BE FILLED WITH APPROVED WELL-GRADED BANKRUN MATERIAL. MAXIMUM SIZE OF ROCK 4". FROZEN SOIL, ORGANIC MATERIAL AND DELETERIOUS MATTER NOT ALLOWED. COMPACT TO AT LEAST 95% OF ITS MAXIMUM DENSITY AS DETERMINED BY ASTM D1557. CONTRACTOR SHALL EXERCISE EXTREME CARE DURING EXCAVATION TO AVOID DAMAGE TO BURIED LINES, TANKS, AND OTHER CONCEALED ITEMS. UPON DISCOVERY, DO NOT PROCEED WITH WORK UNTIL RECEIVING WRITTEN INSTRUCTIONS FROM ARCHITECT. A COMPETENT REPRESENTATIVE OF THE OWNER SHALL INSPECT ALL FOOTING EXCAVATIONS FOR SUITABILITY OF BEARING SURFACES PRIOR TO PLACEMENT OF REINFORCING STEEL. PROVIDE DRAINAGE AND DEWATERING AROUND ALL WORK TO AVOID WATER-SOFTENED FOOTINGS.

TREATED TIMBER PILES: PILING SHALL BE SOUND CLASS B, PRESSURE TREATED DOUGLAS FIR PILES, WITH A MINIMUM TIP CIRCUMFERENCE OF 22 INCHES, A MINIMUM BUTT CIRCUMFERENCE OF 38 INCHES AND CONFORMING TO THE PROVISIONS AND REQUIREMENTS OF IBC SECTIONS 1808 & 1810, WSDOT STANDARD SPEC. 9-10.1 AND ASTM D25. DRIVING AND BEARING CAPACITY SHALL CONFORM TO WSDOT STANDARD SPEC. 6-05. PILES SHALL BE DRIVEN TO AN ESTIMATED DEPTH OF 40 FEET BELOW FINISH GRADE OR AS REQUIRED DEEPER TO ACHEIVE 20 TON CAPACITY RATING. PILES SHALL BE MARKED IN ONE-FOOT INCREMENTS TO FACILITATE RECORDING OF BLOW COUNTS. PILES SHALL BE BANDED PER WSDOT 9-10.1.

THE LENGTH OF PILE REQUIRED AND THE PILE INSTALLATION SHALL BE VERIFIED IN THE FIELD BY A QUALIFIED INSPECTOR WHO SHALL EVALUATE THE CONTRACTOR'S OPERATION AND COLLECT, INTERPRET AND RECORD THE DATA. A MINIMUM OF TWO INDICATOR PILES SHALL BE DRIVEN BEFORE ORDERING PRODUCTION PILES TO ESTIMATE TRUE PILE LENGTHS AND DETERMINE DRIVING CHARACTERISTICS AND PROBLEMS. A QUALIFIED INSPECTOR SHALL EVALUATE INSTALLATION OF INDICATOR PILES

CONCRETE

MIX DESIGNS: THE CONTRACTOR SHALL DESIGN CONCRETE MIXES THAT MEET OR EXCEED THE REQUIREMENTS OF THE CONCRETE MIX TABLE. THE MIX DESIGNS SHALL FACILITATE ANTICIPATED PLACEMENT METHODS, WEATHER, REBAR CONGESTION, ARCHITECTURAL FINISHES, CONSTRUCTION SEQUENCING, STRUCTURAL DETAILS, AND ALL OTHER FACTORS REQUIRED TO PROVIDE A STRUCTURALLY SOUND, AESTHETICALLY ACCEPTABLE FINISHED PRODUCT. WATER REDUCING ADMIXTURES WILL LIKELY BE REQUIRED TO MEET THESE REQUIREMENTS. CONCRETE MIX DESIGNS SHALL CLEARLY INDICATE THE TARGET SLUMP. SLUMP TOLERANCE SHALL BE ± 1-1/2 INCHES.

AGGREGATE: COARSE AND FINE AGGREGATE SHALL CONFORM TO ASTM C33.

CEMENT: CEMENT SHALL CONFORM TO ASTM C150, TYPE II PORTLAND CEMENT, UNLESS NOTED OTHERWISE.

FLYASH: SHALL CONFORM TO ASTM C618 CLASS C OR F, MAXIMUM LOSS OF IGNITION SHALL BE 1.0%.

SLAG: GROUND GRANULATED BLAST-FURNACE (GGBF) SLAG SHALL CONFORM TO ASTM C989 GRADE 100 OR 120.

ALTERNATE MIX DESIGNS: VARIATIONS TO THE MIX DESIGN PROPORTIONS MAY BE ACCEPTED IF SUBSTANTIATED IN ACCORDANCE WITH ACI 318, CHAPTER 5. PROVIDE SUBMITTALS A MINIMUM OF TWO WEEKS PRIOR TO BID FOR DETERMINATION OF ACCEPTABILITY.

ADMIXTURES: ADMIXTURES SHALL BE BY MASTER BUILDERS, W.R. GRACE, OR PRE-APPROVED EQUAL. ALL MANUFACTURERS RECOMMENDATIONS SHALL BE FOLLOWED.

WATER: SHALL BE CLEAN AND POTABLE.

MAXIMUM CHLORIDE CONTENT: THE MAXIMUM WATER SOLUBLE CHLORIDE CONTENT SHALL NOT EXCEED 0.15% BY WEIGHT OF CEMENTITIOUS MATERIAL UNLESS NOTED OTHERWISE.

CONCRETE EXPOSED TO WEATHER: PROVIDE 5.0% TOTAL AIR CONTENT FOR ALL CONCRETE EXPOSED TO WEATHER. TOTAL AIR CONTENT IS THE SUM OF ENTRAINED AIR PROVIDED BY ADMIXTURES AND NATURALLY OCCURRING ENTRAPPED AIR. AIR CONTENT SHALL BE TESTED PRIOR TO BEING PLACED IN THE PUMP HOPPER OR BUCKET; IT IS NOT REQUIRED TO BE TESTED AT THE DISCHARGE END OF THE PUMP HOSE. THE TOLERANCE ON ENTRAPPED AIR SHALL BE +2.0% AND -1.5% WITH THE AVERAGE OF ALL TESTS NOT LESS THAN THE SPECIFIED AMOUNT.

TOTAL CEMENTITIOUS MATERIAL: THE SUM OF ALL CEMENT PLUS FLYASH AND SLAG. AT THE CONTRACTORS OPTION FLYASH OR SLAG MAY BE SUBSTITUTED FOR CEMENT BUT SHALL NOT EXCEED 25% BY WEIGHT OF TOTAL CEMENTITIOUS MATERIAL. IN NO CASE SHALL THE AMOUNT OF FLYASH OR SLAG BE LESS THAN REQUIRED BY THE CONCRETE MIX DESIGN TABLE. FOOTING MIXES SHALL CONTAIN NOT LESS THAN 5 SACKS OF CEMENTITOUS MATERIAL PER CUBIC YARD. ALL OTHER MIXES SHALL CONTAIN NOT LESS THAN 5-1/2 SACKS OF CEMENTITOUS MATERIAL PER CUBIC YARD, UNLESS NOTED OTHERWISE.

ITEM	DESIGN f'c (PSI) (AT 28 DAYS U.N.O.)	MAX. W/C RATIO	MIN. FLYASH OR SLAG PCY	AGGREGATE GRADING ASTM AASHTO	NOTE
SLAB ON GRADE	3000	0.50		57 OR 67	
FOOTINGS	3000	0.50	--	57 OR 67	
STEM WALLS	3000	0.50	100	57 OR 67	
STRUCTURAL SLAB	4000	0.45	--	57 OR 67	

CONCRETE PLACEMENT

PLACE CONCRETE FOLLOWING ALL APPLICABLE ACI RECOMMENDATIONS. CONCRETE SHALL BE PROPERLY CONSOLIDATED PER ACI 309 USING INTERIOR MECHANICAL VIBRATORS, DO NOT OVER-VIBRATE. CONCRETE SHALL BE POURED MONOLITHICALLY BETWEEN CONSTRUCTION OR EXPANSION JOINTS. IF CONCRETE IS PLACED BY THE PUMP METHOD, HORSES SHALL BE PROVIDED TO SUPPORT THE HOSE. THE HOSE SHALL NOT BE ALLOWED TO RIDE ON THE REINFORCING. WEATHER FORECASTS SHALL BE MONITORED AND ACI RECOMMENDATIONS FOR HOT AND COLD WEATHER CONCRETING SHALL BE FOLLOWED AS REQUIRED. CONCRETE SHALL NOT FREE FALL MORE THAN 5 FEET DURING PLACEMENT WITHOUT WRITTEN APPROVAL OF STRUCTURAL ENGINEER.

FORMED SURFACES:

FORMWORK CLASS OF SURFACE PER ACI 347 TABLE 3.1	
ITEM	CLASS OF FINISH
ALL SURFACES EXPOSED TO PUBLIC VIEW, U.N.O.	A
ALL SURFACES RECEIVING A COURSE TEXTURED COATING SUCH AS PLASTER OR STUCCO, UNLESS NOTED OTHERWISE	B
ALL OTHER SURFACES, UNLESS NOTED OTHERWISE	C

COLD WEATHER PLACEMENT

1. COLD WEATHER IS DEFINED BY ACI 306 AS "A PERIOD WHEN FOR MORE THAN 3 SUCCESSIVE DAYS THE MEAN DAILY TEMPERATURE DROPS BELOW 40° F."
2. NO CONCRETE SHALL BE PLACED ON FROZEN OR PARTIALLY FROZEN GROUND. THAWING THE GROUND WITH HEATERS IS PERMISSIBLE.
3. CONCRETE MIX TEMPERATURES SHALL BE AS SHOWN BELOW. HEATING OF WATER AND/OR AGGREGATES MAY BE REQUIRED TO ATTAIN THESE TEMPERATURES.
4. THE CONCRETE MAY REQUIRE PROTECTION FOR 4-7 DAYS AFTER POURING. IF TEMPERATURES REMAIN BELOW FREEZING, INSULATING BLANKET COVERAGE IS REQUIRED. IF TEMPERATURES ARE SLIGHTLY BELOW FREEZING (30° F MIN.) AT NIGHT AND ABOVE FREEZING DURING THE DAY, KRAFT PAPER WITH COMPLETE COVERAGE MAY BE USED IN LIEU OF INSULATED BLANKETS.
5. NO ADDITIVES CONTAINING CHLORIDES SHALL BE USED. USE "POZZUTEC 20+" BY MASTER BUILDERS OR "POLARSET" BY W.R. GRACE OR PRE-APPROVED EQUAL.

CONDITION OF PLACEMENT AND CURING		WALLS & SLABS	FOOTINGS
MIN. TEMP. FRESH CONCRETE AS MIXED FOR WEATHER INDICATED. DEGREES F.	ABOVE 30° F.	60	55
	0 TO 30° F.	65	60
	BELOW 0° F.	70	65
MIN. TEMP. FRESH CONCRETE AS PLACED AND MAINTAINED, DEGREES F.		55	50
MAX. ALLOWABLE GRADUAL DROP IN TEMP. THROUGHOUT FIRST 24 HOURS AFTER END OF PROTECTION, DEGREES F.		50	40

HOT OR WINDY WEATHER PLACEMENT

HOT WEATHER IS DEFINED BY ACI 305 AS "ANY COMBINATION OF HIGH AIR TEMPERATURE, LOW RELATIVE HUMIDITY, AND WIND VELOCITY, TENDING TO IMPAIR THE QUALITY OF FRESH HARDENED CONCRETE.. ACI 305 FIGURE 2.1.5 SHALL BE USED BY THE CONTRACTOR TO ESTIMATE THE RATE OF EVAPORATION. WHEN THE ESTIMATED RATE OF EVAPORATION IS GREATER THAN 0.2 PSF/HOUR THE PLACEMENT SHALL BE CONSIDERED A HOT WEATHER PLACEMENT. PRECAUTIONS AGAINST PLASTIC SHRINKAGE CRACKING ARE NECESSARY. PRECAUTIONS TAKEN BY THE CONTRACTOR VARY DEPENDING

REINFORCING STEEL

REINFORCING STEEL SHALL CONFORM TO:

ASTM A615, GRADE 60 ... EXCEPT GRA

DETAIL, FABRICATE AND PLACE PER ACI 315 AND ACI 318. PROVIDE CORNE FOR HORIZONTAL REINFORCING IN FOOTINGS & GRADE BEAMS.

REINFORCING SPLICE AND DEVELOPMENT LENGTH SCHEDULE, Fy=60 KSI

BAR SIZE	MINIMUM LAP SPLICE LENGTHS ("Ls")		MINIMUM DEVELOPMENT LEN	
	TOP BARS (1)	OTHER BARS	TOP BARS (1)	OT
#3	2'-0"	1'-6"	1'-6"	
#4	2'-8"	2'-0"	2'-0"	
#5	3'-4"	2'-7"	2'-7"	
#6	4'-0"	3'-1"	3'-1"	
#7	5'-10"	4'-6"	4'-6"	
#8	6'-8"	5'-2"	5'-2"	

SPLICE TABLE NOTE:

1. "TOP BARS" ARE HORIZONTAL BARS WITH MORE THAN 12" DEPTH

OVER REINFORCEMENT AS FOLLOWS, UNL

STEEL

DETAILING, FABRICATION AND ERECTION

ALL WORKMANSHIP SHALL CONFORM TO THE AISC MANUAL OF THE AISC SPECIFICATION FOR STRUCTURAL STEEL BUILDINGS STANDARD PRACTICE, MARCH 13, 2005 AND THE AISC SEISMI BUILDINGS, MARCH 9, 2005 INCLUDING SUPPLEMENT NO. 1, N

MATERIAL PROPERTIES

OTHER SHAPES AND PLATES: ASTM A36 (Fy = 36 KSI) TYP WHERE INDICATED

HOLLOW STRUCTURAL SECTIONS: RECTANGULAR & SQUARE ROUND - ASTM A500 GRADE B (Fy = 42 KSI)

STRUCTURAL STEEL PIPES: ASTM A53, GRADE B, TYPE E

MACHINE BOLTS (M.B.): ASTM A307, GRADE A

ANCHOR BOLTS (A.B.): ASTM F1554, GRADE 36, CLASS 2 ASTM F1554, GRADE 105 WHERE INDICATED.

EXPANSION ANCHORS: AT CONCRETE, PROVIDE "KWIKBOLT SIMPSON STRONG TIE, INC., OR PRE-APPROVED EQUAL. AT INC., "POWER-BOLT" BY POWERS/RAWL FASTENING, INC. OR OR PRE-APPROVED EQUAL. EMBED BOLT INTO CONCRETE UNLESS NOTED OTHERWISE. INSTALL ANCHOR PER MANUFA

FINISH: STRUCTURAL STEEL SHALL BE PRIMER PAINTED, U CLEAN OF LOOSE RUST, LOOSE MILL SCALE, OIL, GREASE SHALL MEET THE REQUIREMENTS OF SSPC/SP1. WHERE S GALVANIZED, IT SHALL BE HOT-DIP GALVANIZED IN ACCOR ALL SURFACES WITHIN TWO INCHES OF ANY FIELD WELD L THAT WOULD PREVENT PROPER WELDING OR PRODUCE OB PRIMED, PAINTED, AND GALVANIZED SURFACES SHALL BE ABRASIONS, AS WELL AS TO PROTECT ALL AREAS AT C

WELDING:

STRUCTURAL STEEL: WELD IN ACCORDANCE WITH "STRU

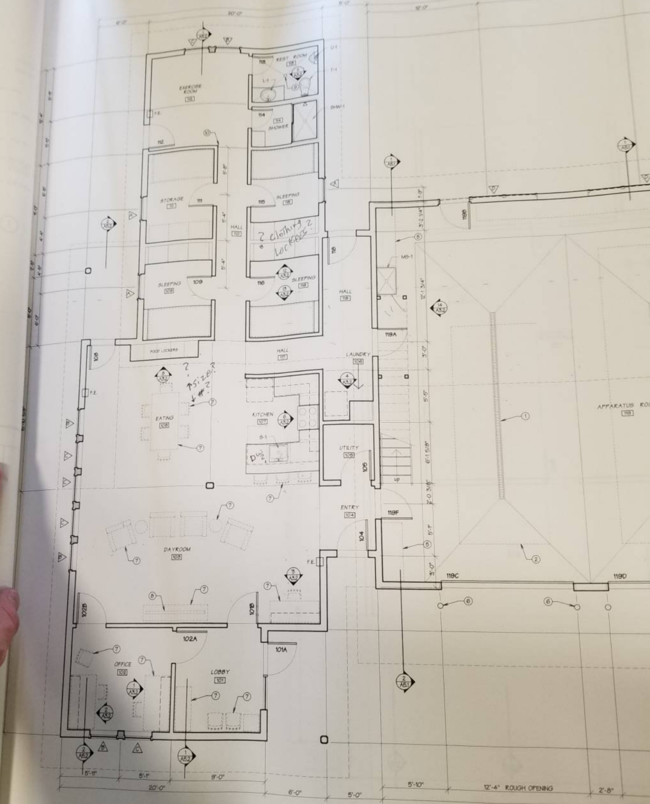
CERTIFICATION: ALL WELDING SHALL BE PERFORMED B SHALL BE PREQUALIFIED FOR EACH POSITION AND WELD PERFOMING.

CARPENTRY:

NAILS: CONNECTION DESIGNS ARE BASED ON "COM

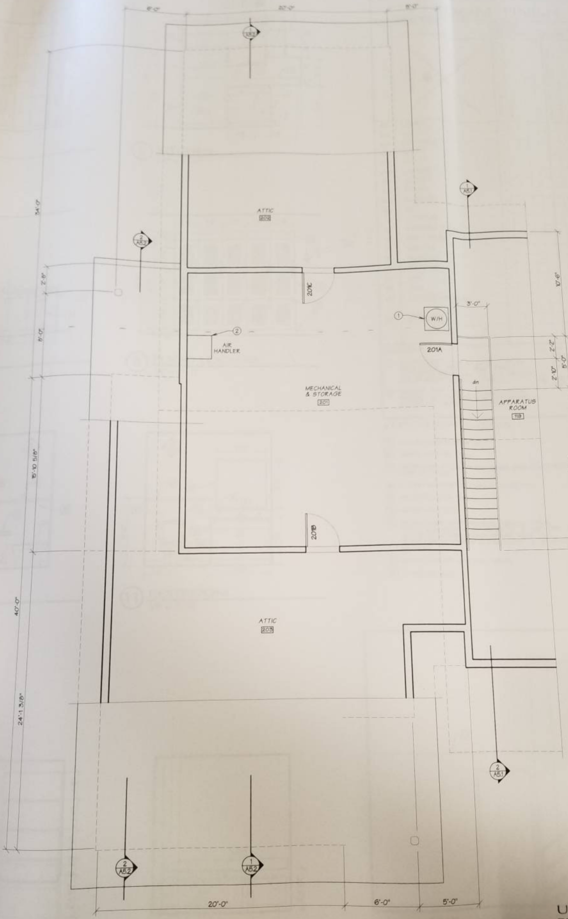
PENNYWEIGHT	DIAMETER (INCHES)
8d	0.131
10d	0.148
16d	0.162
	0.192

FASTENER TYPE	DIAMETER (INCHES)	LEN (INC
8d COMMON WIRE	0.131	2-
8d "DIPPED GALV. BOX"	0.1__	
8d "SHINY BOX"	0.113	
12 GA. STAPLES	0.1055	
14 GA. STAPLES	0.080	
15 GA STAPLES	0.072	
10d COMMON WIRE	0.148	
10d "HOT DIPPED GALV. BOX"	0.148	
10d "SHINY BOX"	0.128	



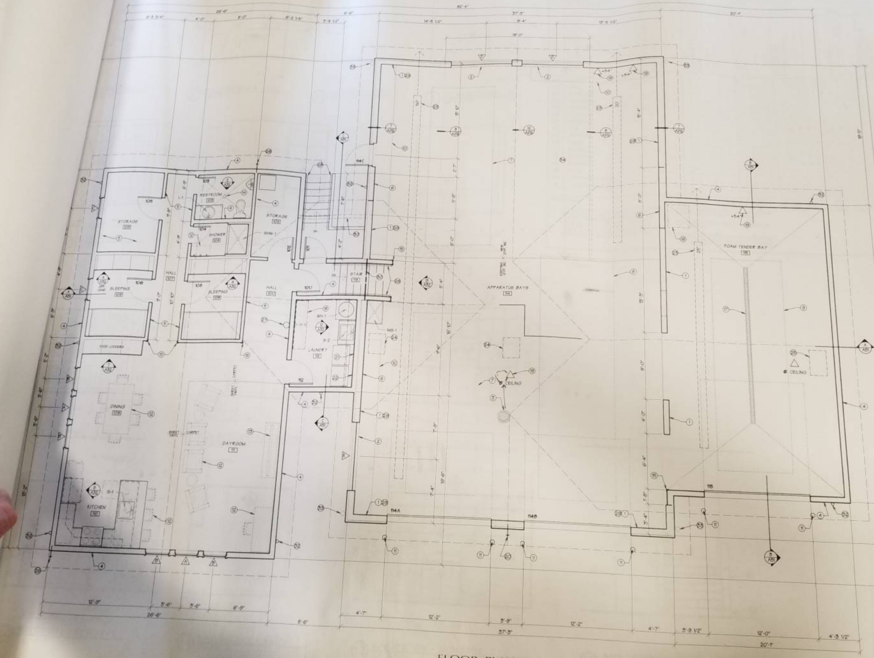
MAIN
FLOOR PLAN

0 3 9



UPPER
FLOOR PLAN

0 3 9



FLOOR PLAN 1/4" = 1'-0"

PLAN NOTES

1. EXISTING CMU BLOCK WALL
2. EXISTING WINDOW
3. EXISTING GRATED MANHOLE
4. NEW 2 x 6 WOOD STUDS
5. NEW 2 x 4 WOOD STUDS
6. NEW CMU INFILL
7. APPROXIMATE FOOTPRINT
8. APPROXIMATE FOOTPRINT
9. APPROXIMATE FOOTPRINT
10. STORAGE RACKS, CABIN OWNER, TYPICAL
11. CONCRETE FILLED STEEL SEE DETAIL 4/A211
12. FURNITURE TO BE SELE
13. FLAT-PANEL TV SCREE
14. FLOOR DRAIN W/ TRAP
15. CORNER GUARD, TYPI
16. AIR COMPRESSOR LO MATERIALS & MOUNT COMPRESSOR MOTOR FLOODPROOFING ZON PER ALL APPLICABL
17. PROVIDE 19'-0" LO SLAB 1/4", MINIMU PRIMER AS REQUIR
18. PROVIDE (2) UNITS
19. COMPRESSED AIR HOSE & HOSE R
20. EXISTING HOSE B
21. WM-1 RECESSED
22. D-1 RECESSED TERMINATE DUC
23. RADIANT HEAT
24. EXISTING EXHA
25. NEW EXHAUST
26. NEW FREEZE
27. FIRE EXTING
28. HANDRAILS
29. AT EXISTING TREATED P PLYWOOD
30. 5 1/2 x 12
31. 5 1/2 x 9 USE SIMP OF WALL
32. NEW ALL EXISTING
33. EXISTING OFF SIT
34. PROVID SUPPO BUILDI

Appendix F: FEMA E-74 Nonstructural Seismic Bracing Excerpts

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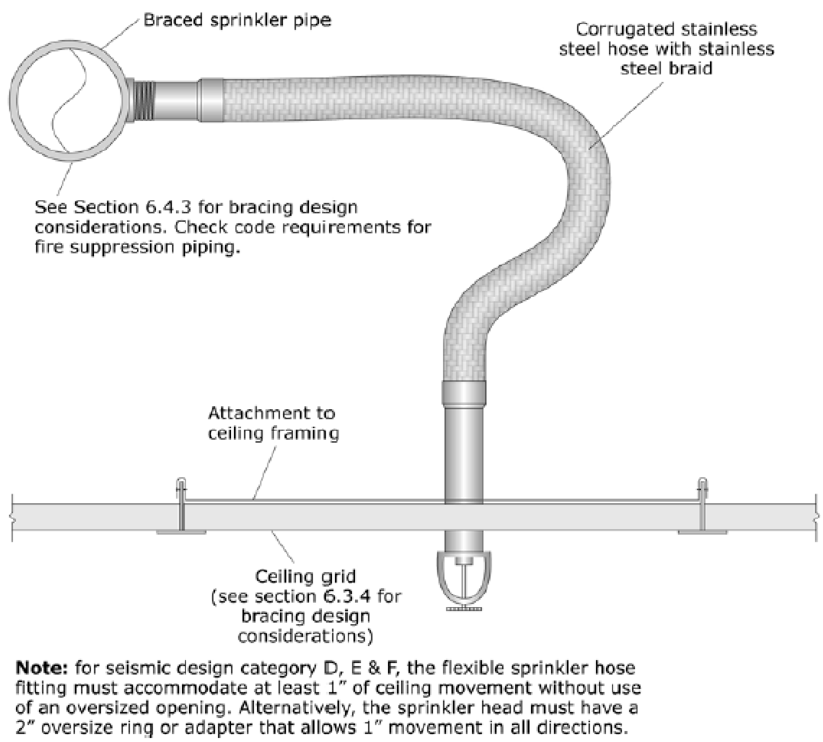


Figure G-1. Flexible Sprinkler Drop.

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)

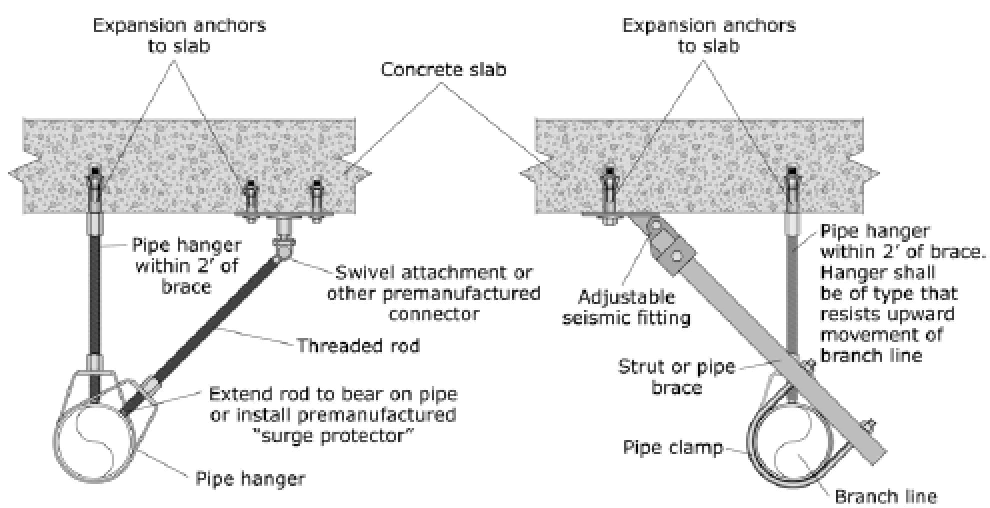


Figure G-2. End of Line Restraint.

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)

Partitions

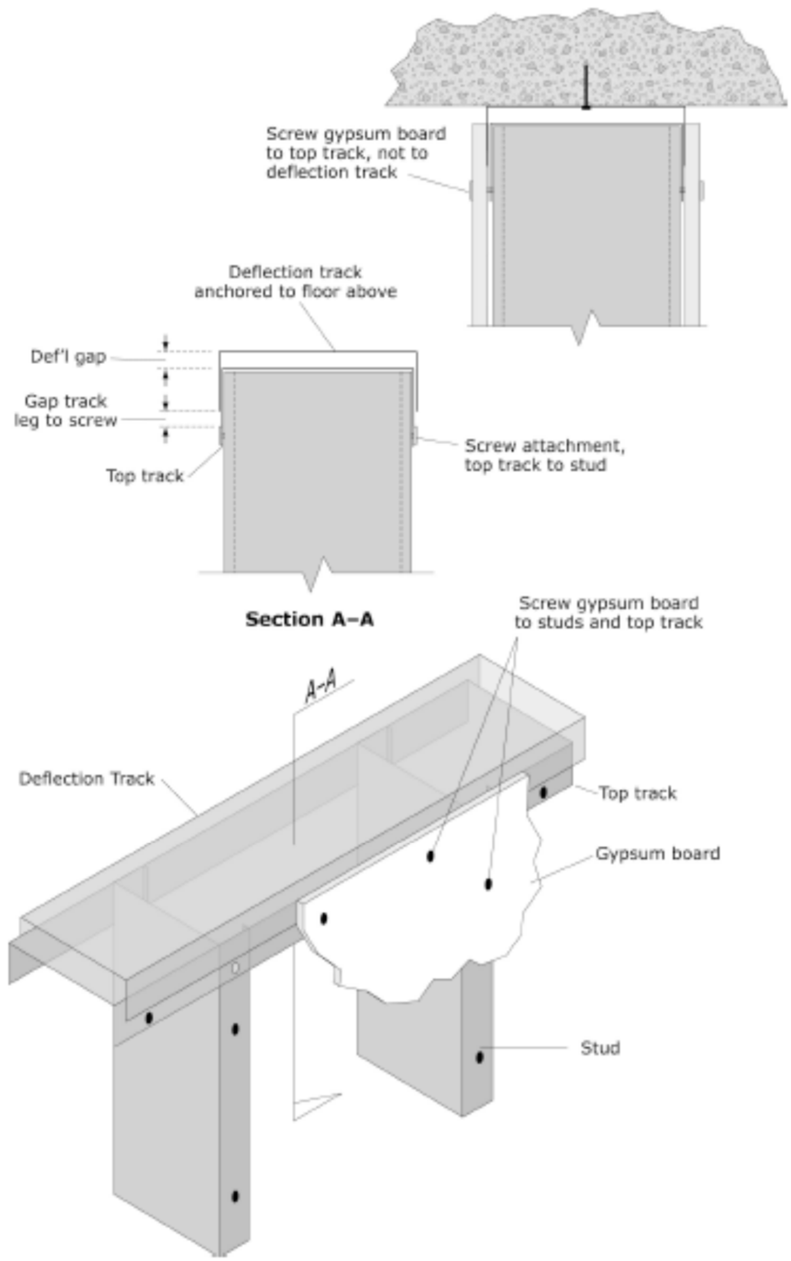


Figure G-3. Mitigation Schemes for Bracing the Tops of Metal Stud Partitions Walls.

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)

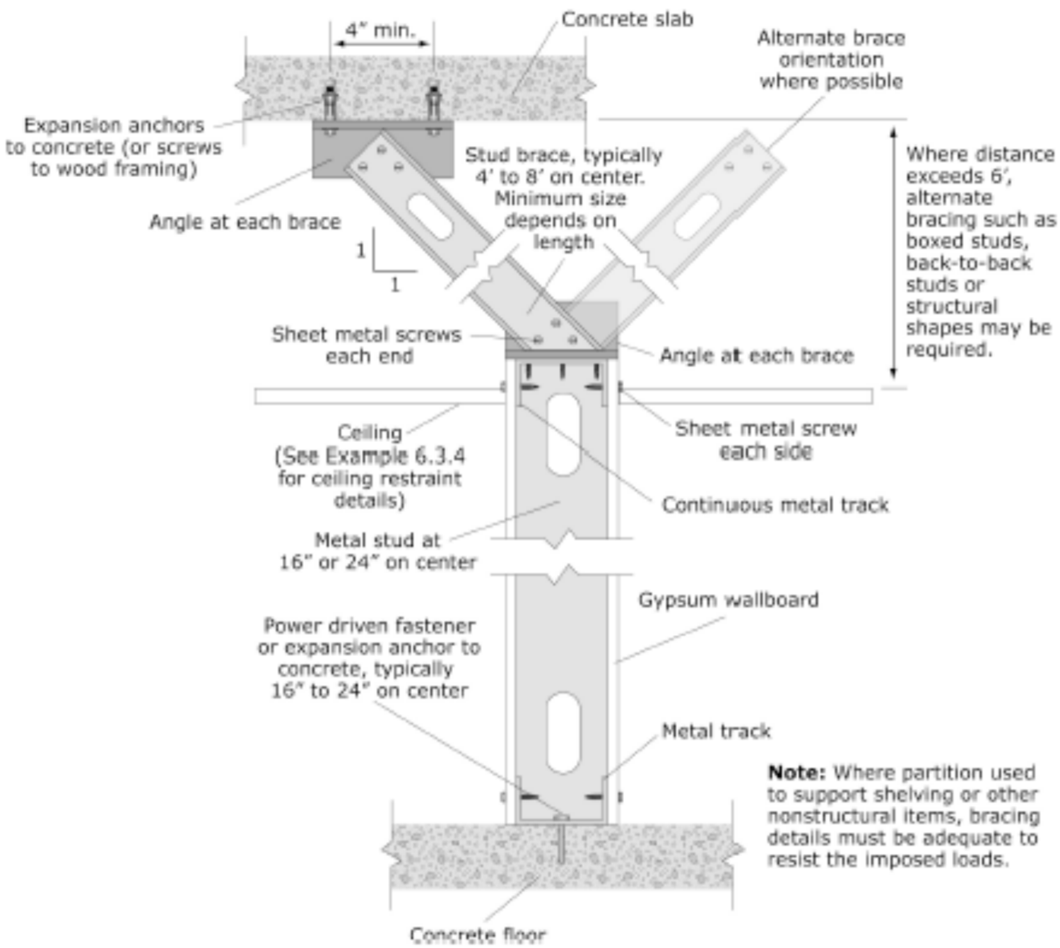
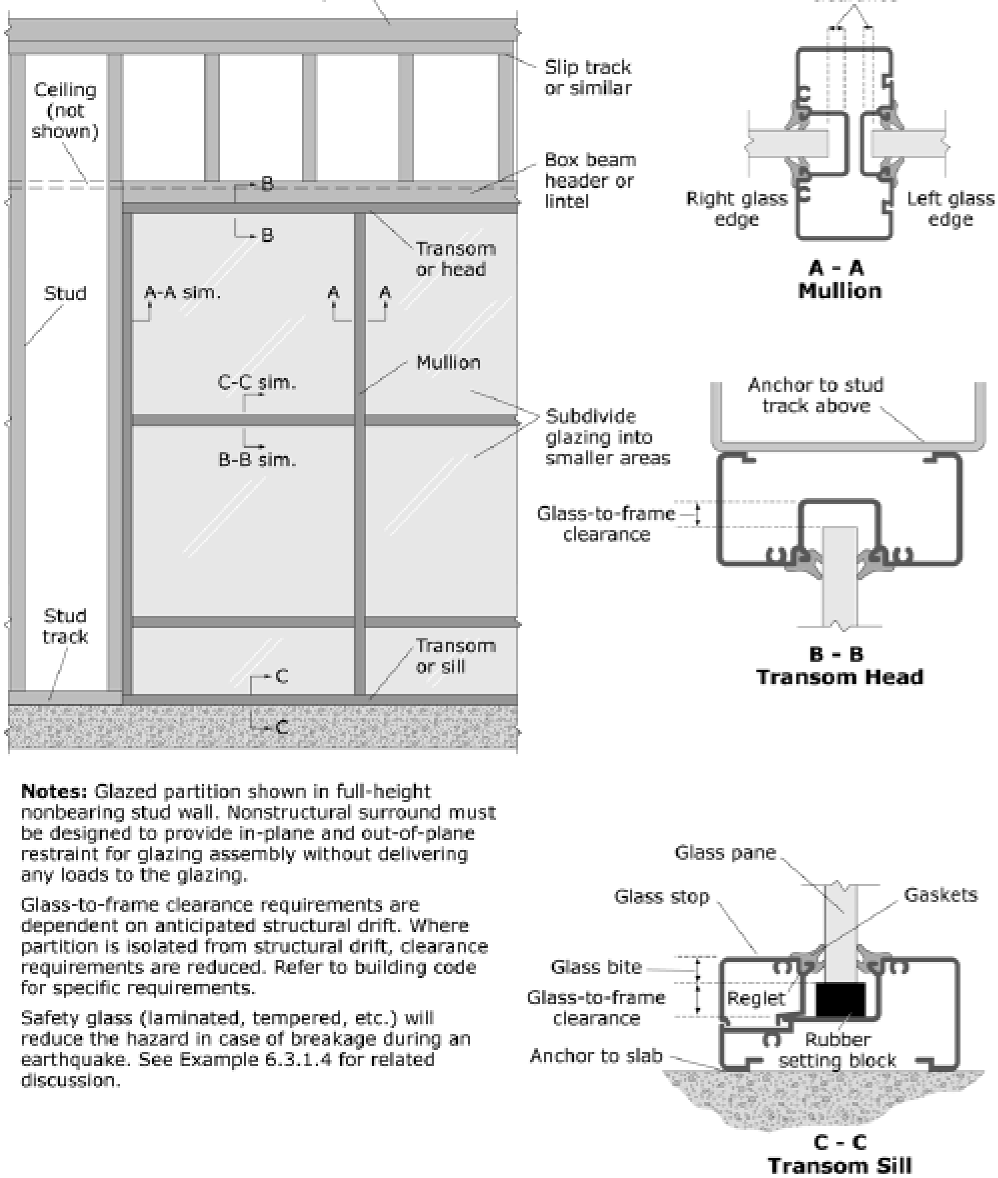


Figure G-4. Mitigation Schemes for Bracing the Tops of Metal Stud Partitions Walls.

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)



Notes: Glazed partition shown in full-height nonbearing stud wall. Nonstructural surround must be designed to provide in-plane and out-of-plane restraint for glazing assembly without delivering any loads to the glazing.

Glass-to-frame clearance requirements are dependent on anticipated structural drift. Where partition is isolated from structural drift, clearance requirements are reduced. Refer to building code for specific requirements.

Safety glass (laminated, tempered, etc.) will reduce the hazard in case of breakage during an earthquake. See Example 6.3.1.4 for related discussion.

Figure G-5. Full-height Glazed Partition.

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)

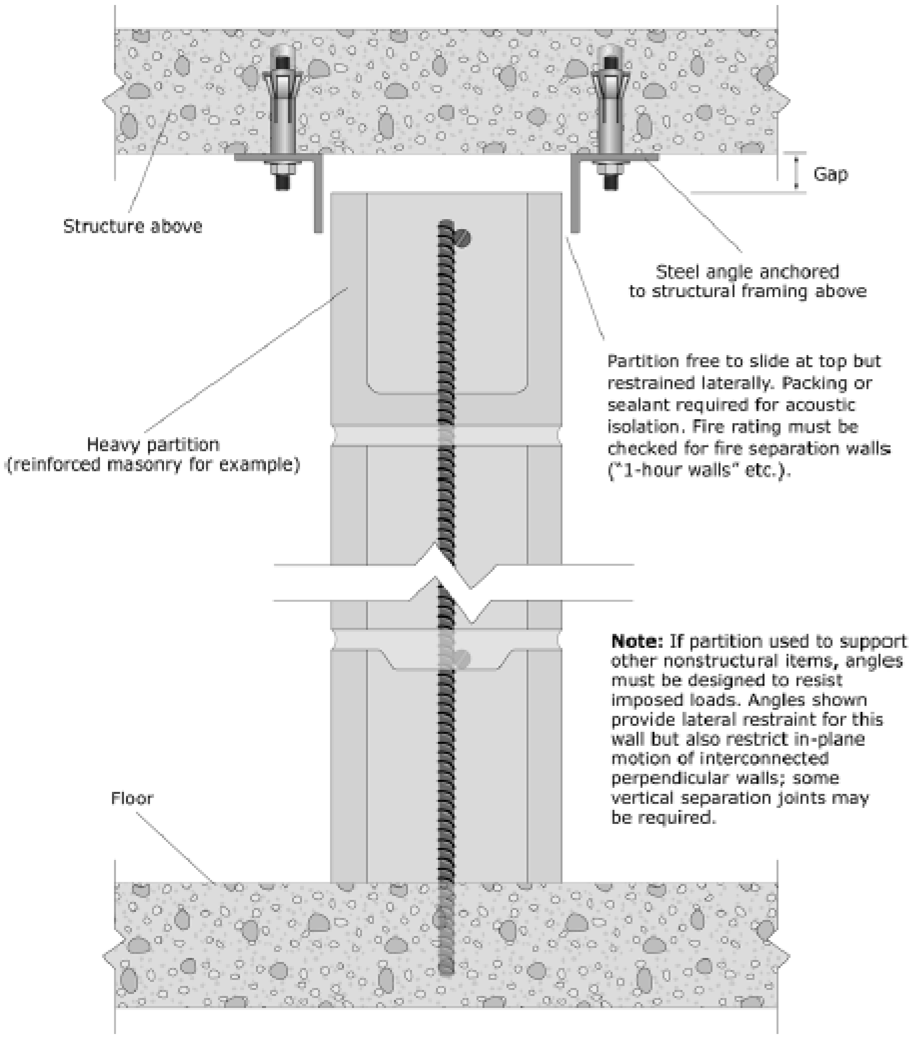


Figure G-6. Full-height Heavy Partition.

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)

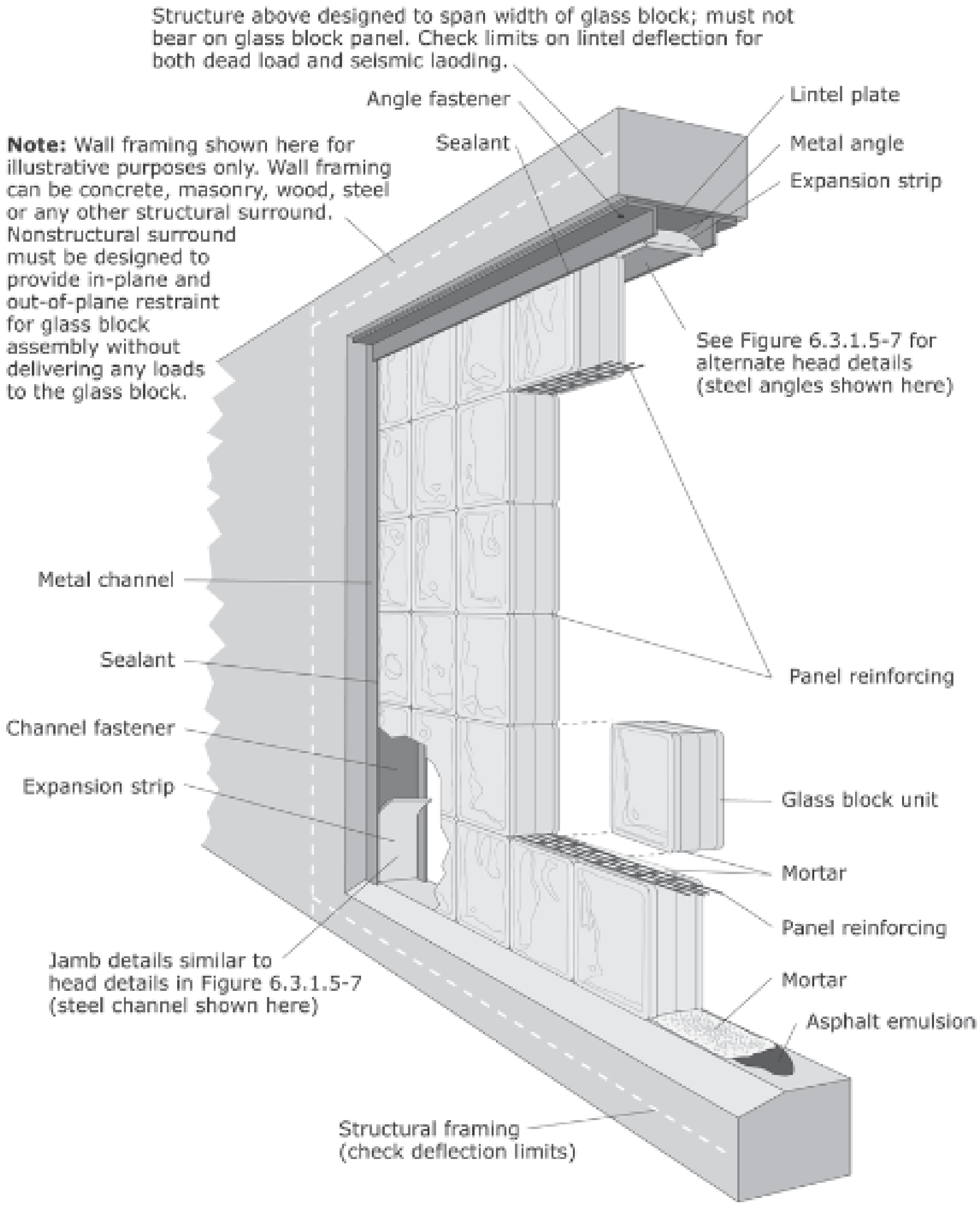


Figure G-7. Typical Glass Block Panel Details.

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)

Ceilings

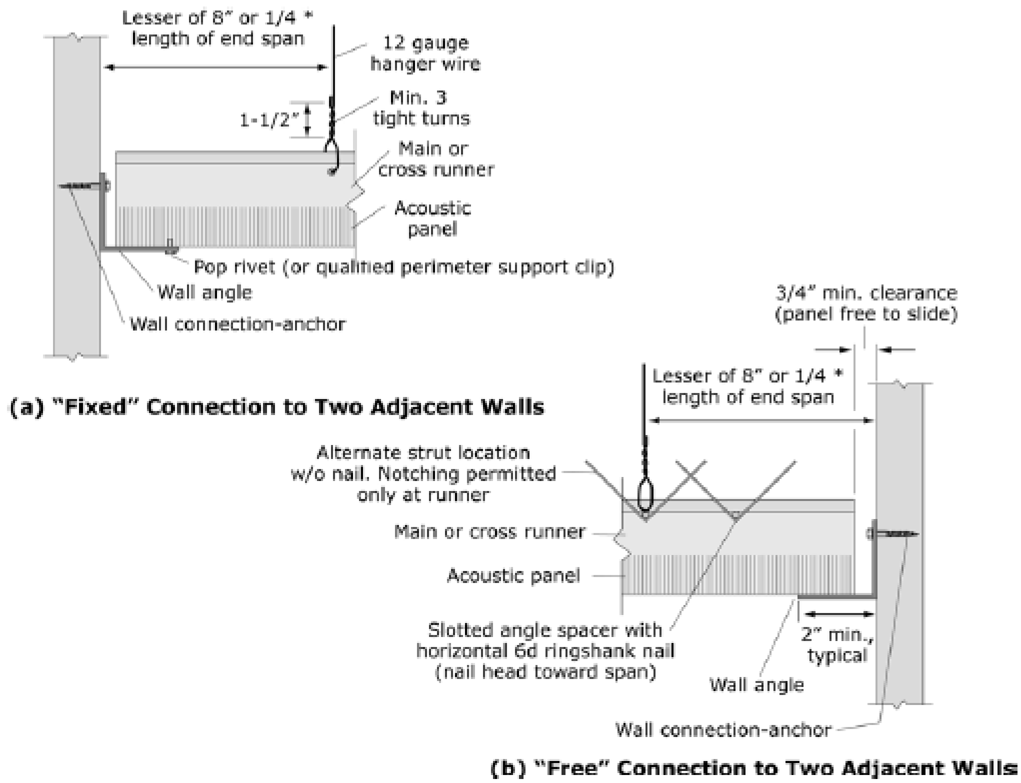
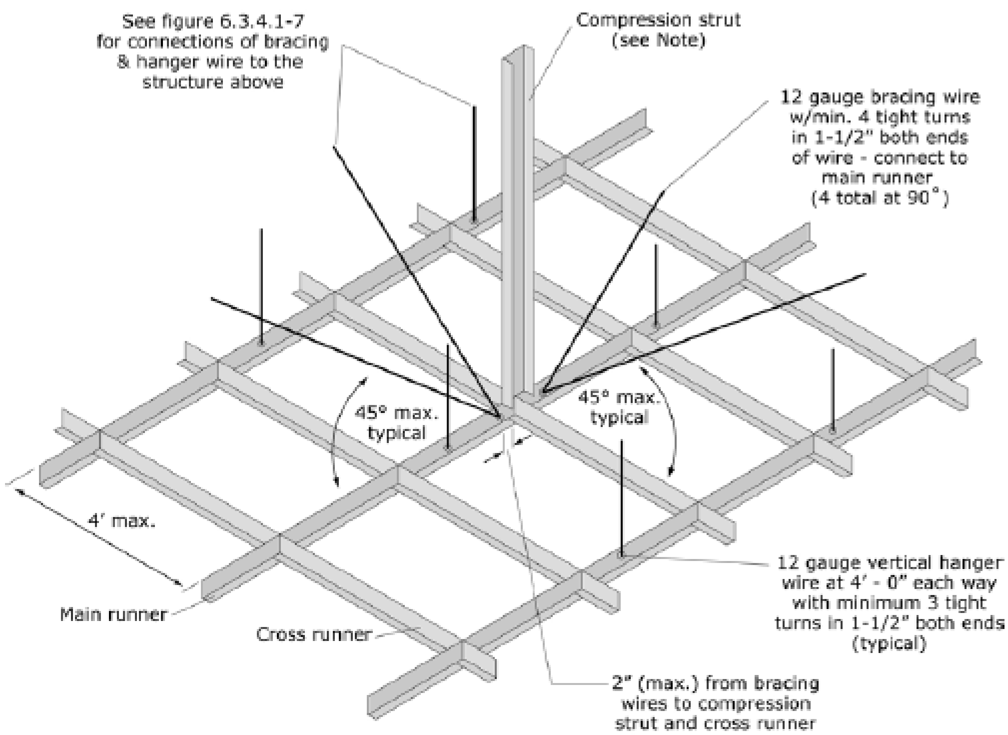


Figure G-8. Suspension System for Acoustic Lay-in Panel Ceilings – Edge Conditions.

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)



Note: Compression strut shall not replace hanger wire. Compression strut consists of a steel section attached to main runner with 2 - #12 sheet metal screws and to structure with 2 - #12 screws to wood or 1/4" min. expansion anchor to structure. Size of strut is dependent on distance between ceiling and structure ($l/r \le 200$). A 1" diameter conduit can be used for up to 6', a 1-5/8" X 1-1/4" metal stud can be used for up to 10'

Per DSA IR 25-5, ceiling areas less than 144 sq. ft, or fire rated ceilings less than 96 sq. ft., surrounded by walls braced to the structure above do not require lateral bracing assemblies when they are attached to two adjacent walls. (ASTM E580 does not require lateral bracing assemblies for ceilings less than 1000 sq. ft.; see text.)

Figure G-9. Suspension System for Acoustic Lay-in Panel Ceilings – General Bracing Assembly.

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)

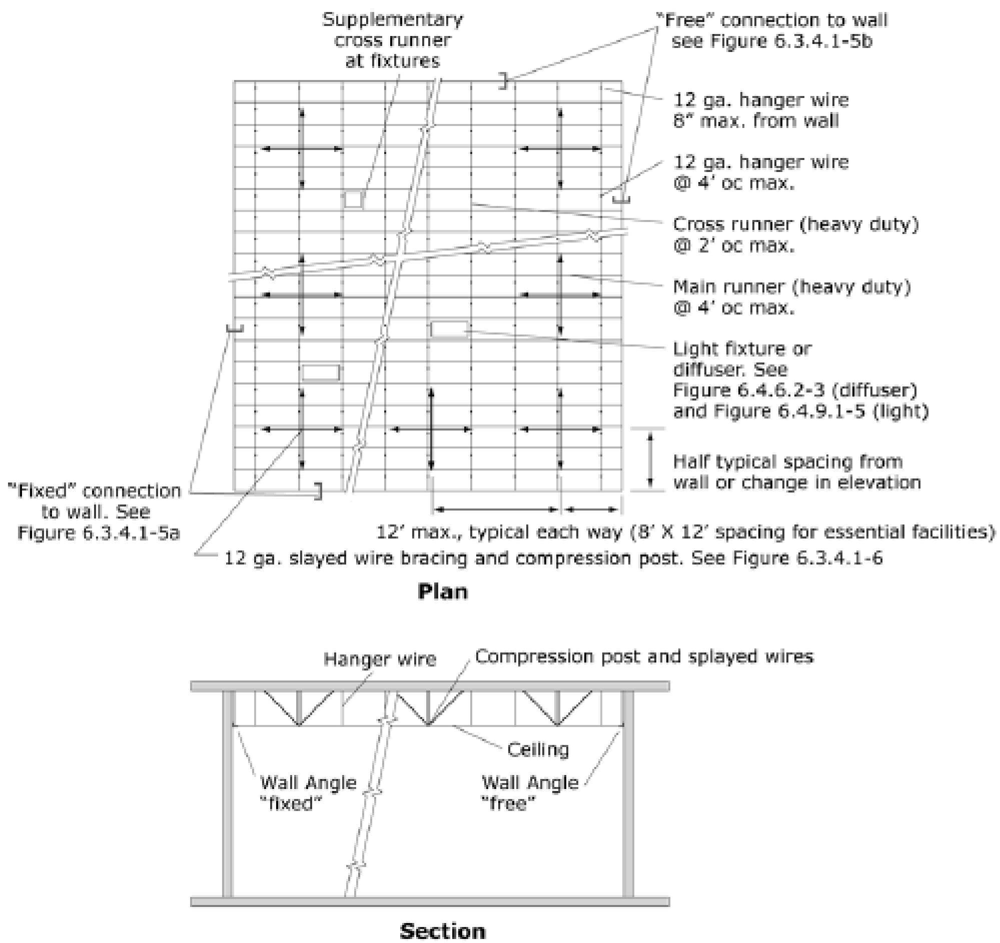


Figure G-10. Suspension System for Acoustic Lay-in Panel Ceilings – General Bracing Layout.

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)

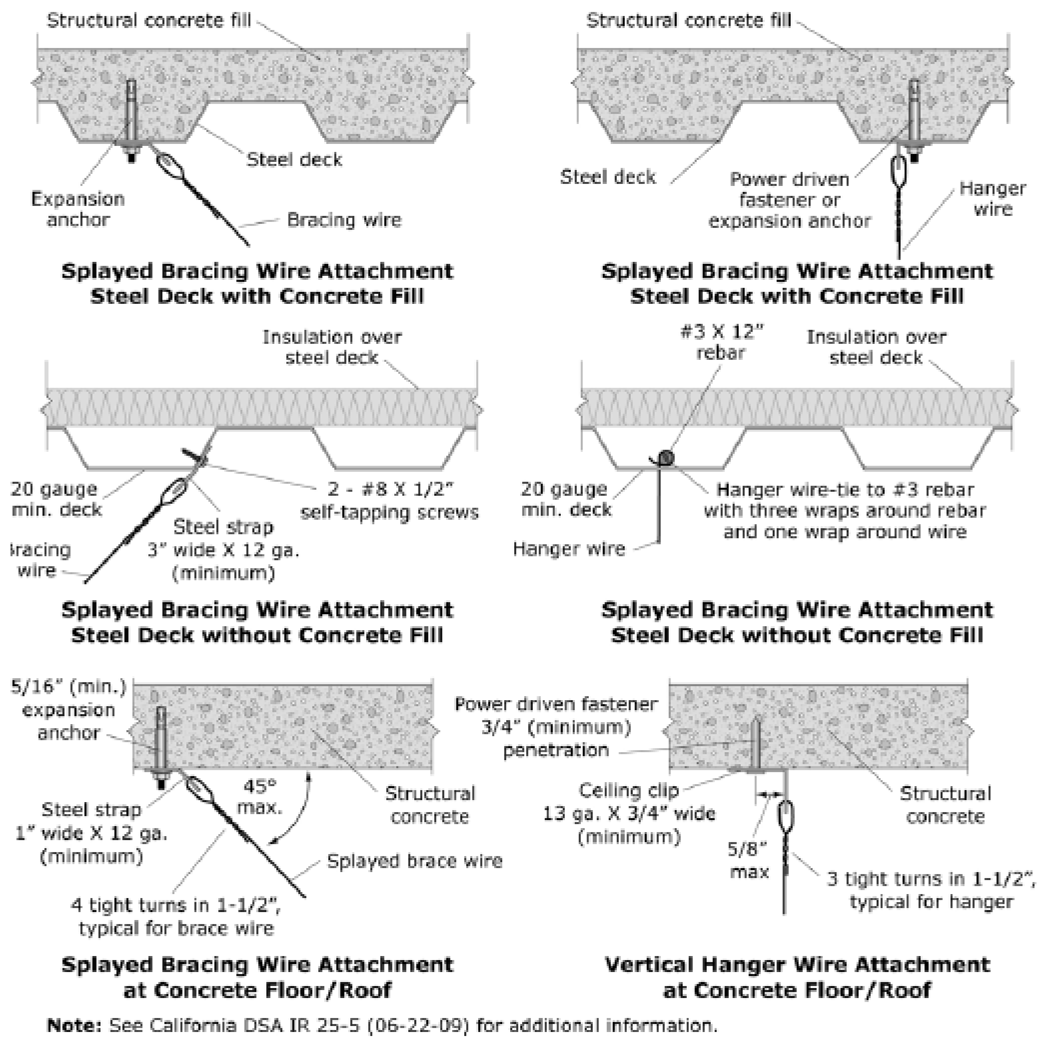
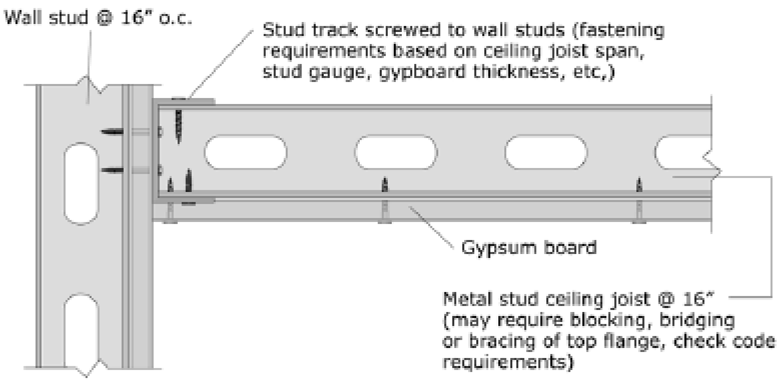
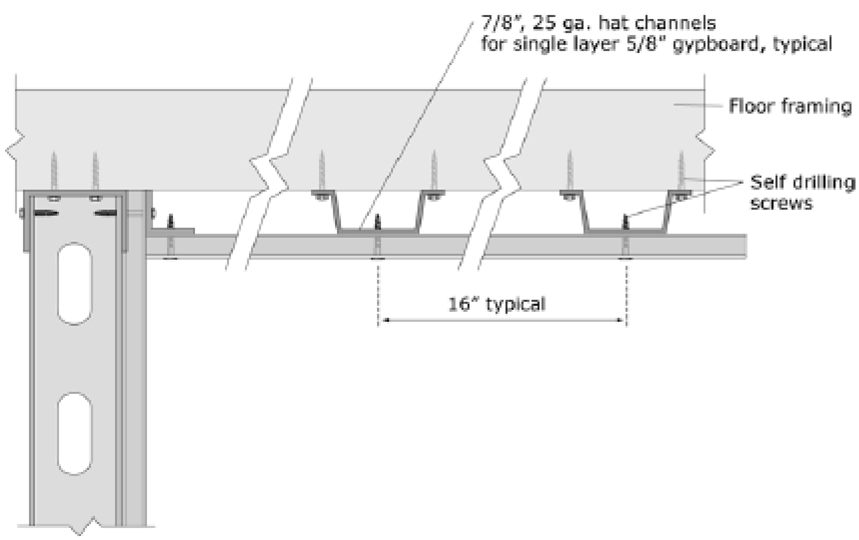


Figure G-11. Suspension System for Acoustic Lay-in Panel Ceilings – Overhead Attachment Details.

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)



a) Gypsum board attached directly to ceiling joists



b) Gypsum board attached directly to furring strips (hat channel or similar)

Note: Commonly used details shown; no special seismic details are required as long as furring and gypboard secured. Check for certified assemblies (UL listed, FM approved, etc.) if fire or sound rating required.

Figure G-12. Gypsum Board Ceiling Applied Directly to Structure.

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)

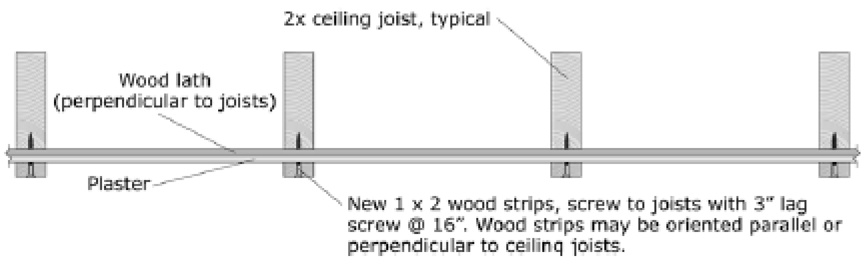


Figure G-13. Retrofit Detail for Existing Lath and Plaster.

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)

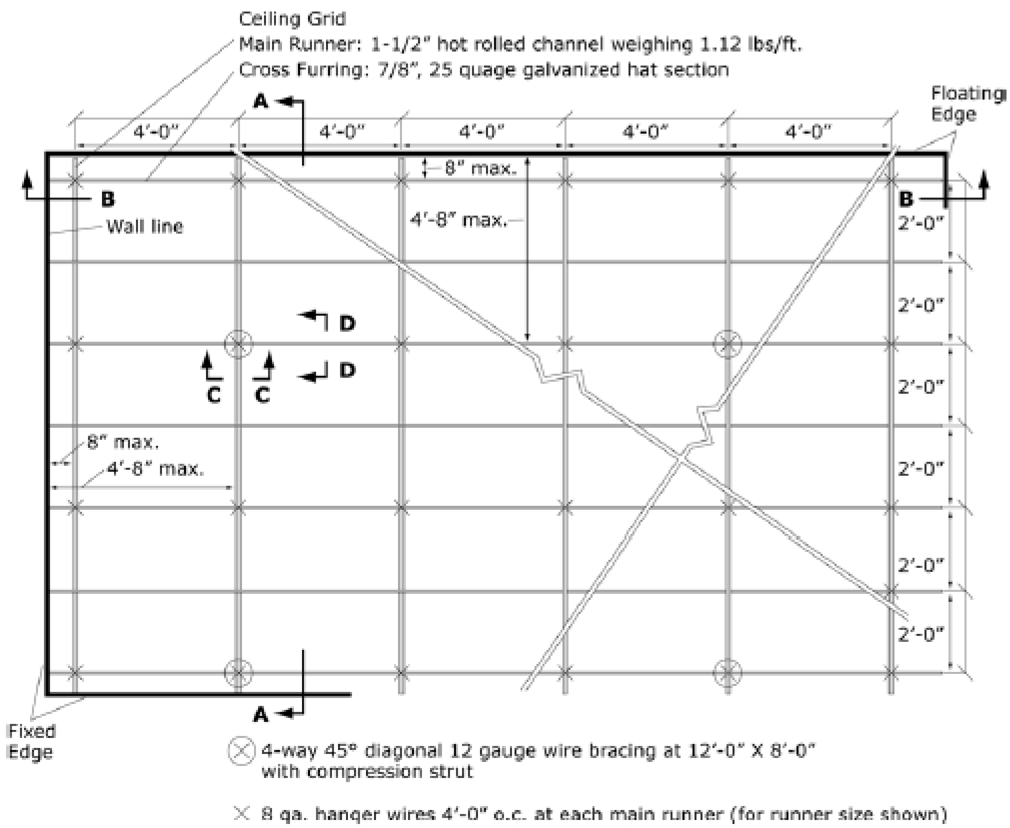


Figure G-14. Diagrammatic View of Suspended Heavy Ceiling Grid and Lateral Bracing.

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)

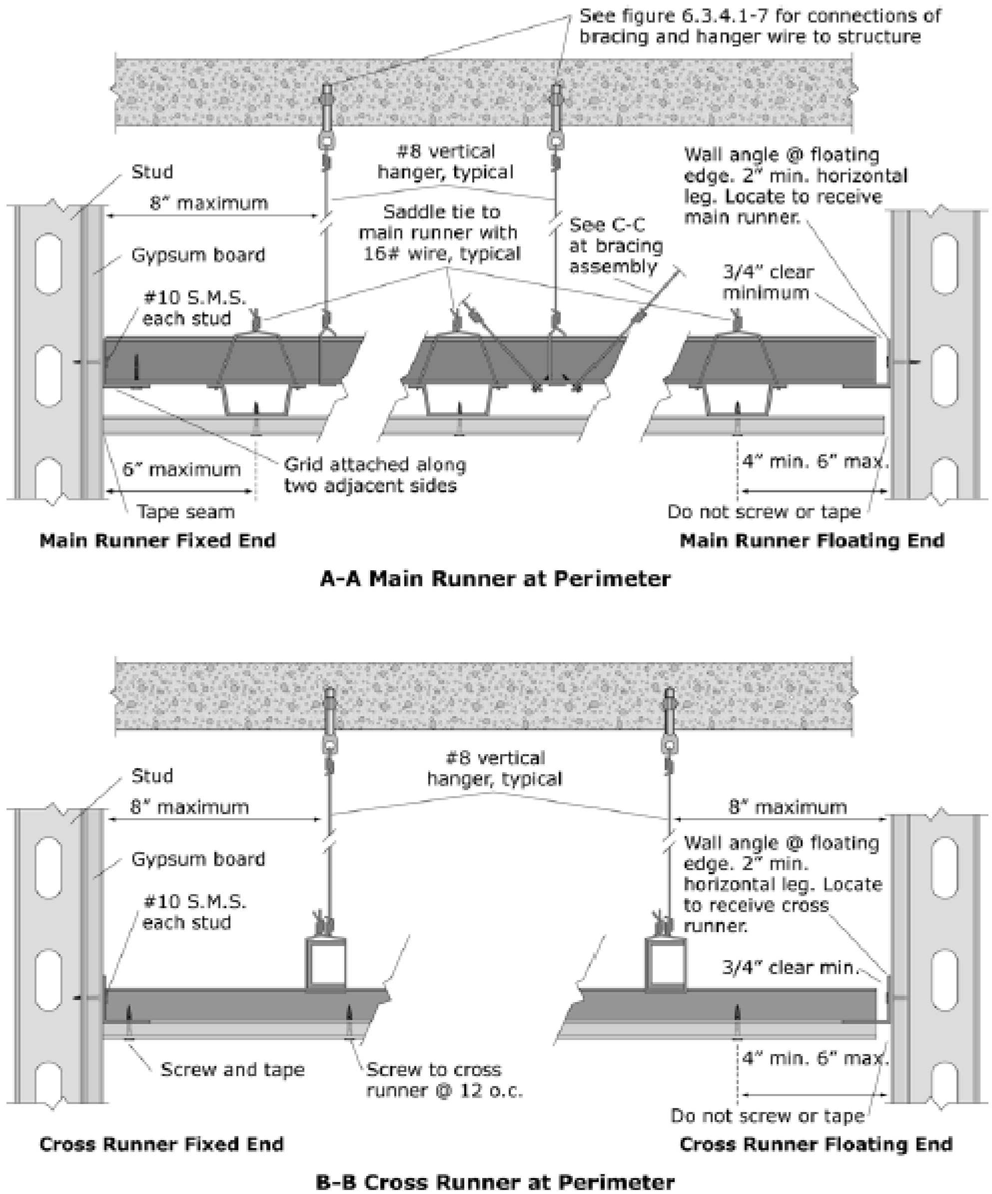
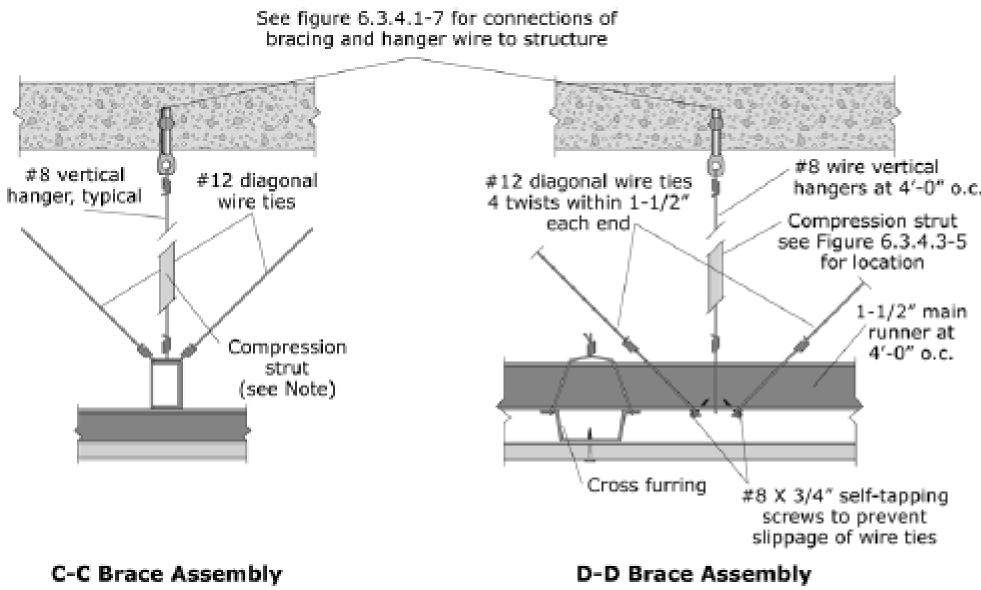


Figure G-15. Perimeter Details for Suspended Gypsum Board Ceiling.

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)



Note: Compression strut shall not replace hanger wire. Compresion strut consists of a steel section attached to main runner with 2 - #12 sheet metal screws and to structure with 2 - #12 screws to wood or 1/4" min. expansion anchor to concrete. Size of strut is dependent on distance between ceiling and structure (l/r ≤ 200). A 1" diameter conduit can be used for up to 6', a 1-5/8" X 1-1/4" metal stud can be used for up to 10'. See figure 6.3.4.1-6 for example of bracing assembly.

Figure G-16. Details for Lateral Bracing Assembly for Suspended Gypsum Board Ceiling.

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)

Light Fixtures

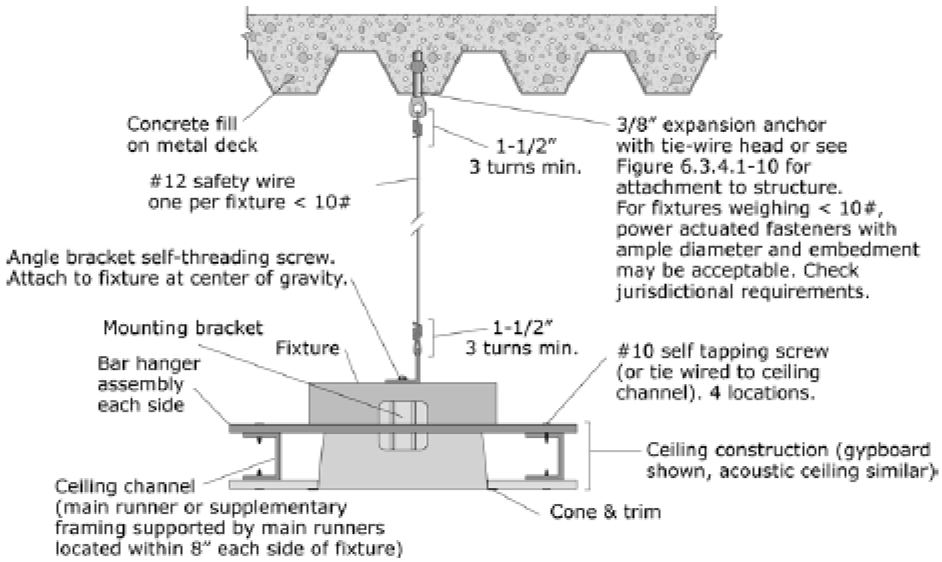


Figure G-17. Recessed Light Fixture in suspended Ceiling (Fixture Weight < 10 pounds).

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)

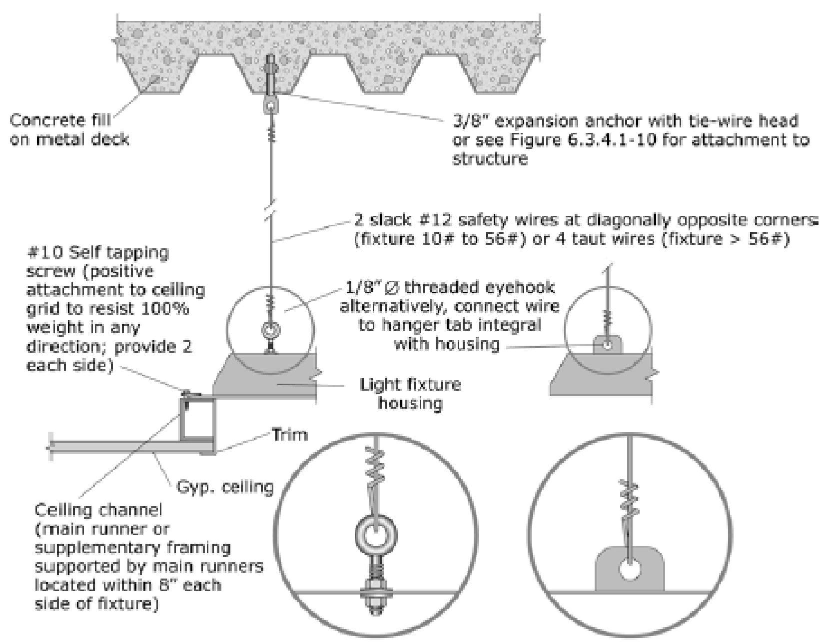


Figure G-18. Recessed Light Fixture in suspended Ceiling (Fixture Weight 10 to 56 pounds).

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)

Contents and Furnishings

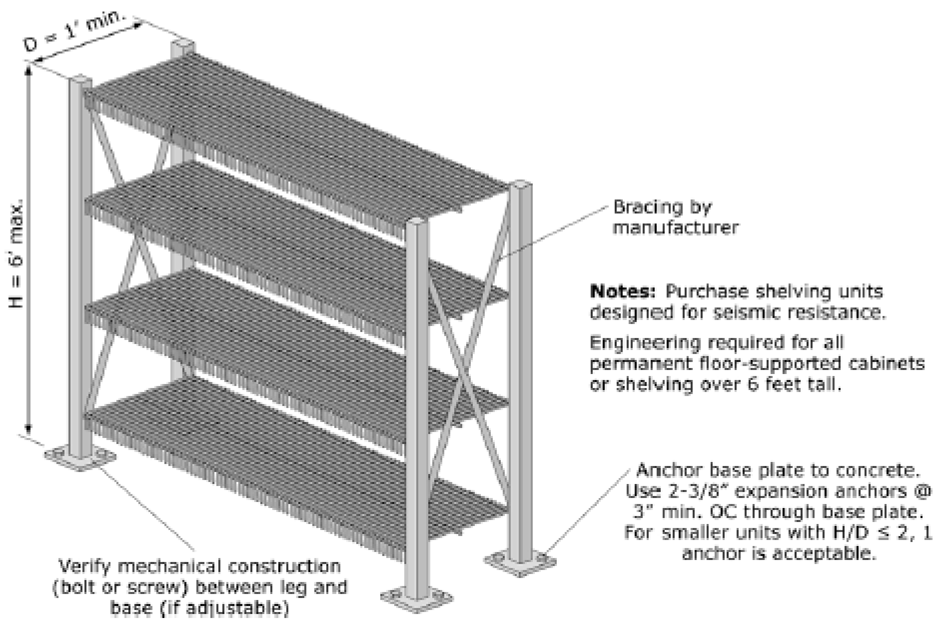
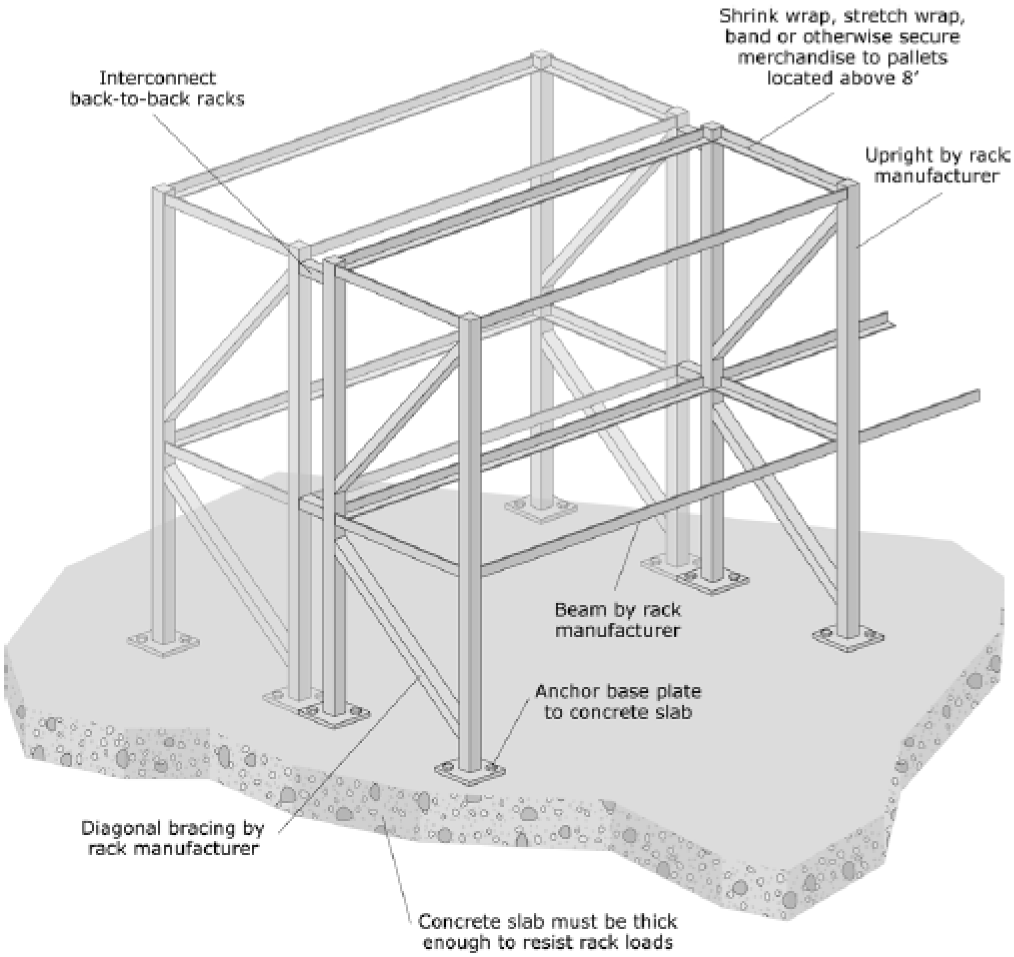


Figure G-19. Light Storage Racks.

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)



Note: Purchase storage racks designed for seismic resistance. Storage racks may be classified as either nonstructural elements or nonbuilding structures depending upon their size and support conditions. Check the applicable code to see which provisions apply.

Figure G-20. Industrial Storage Racks.

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)

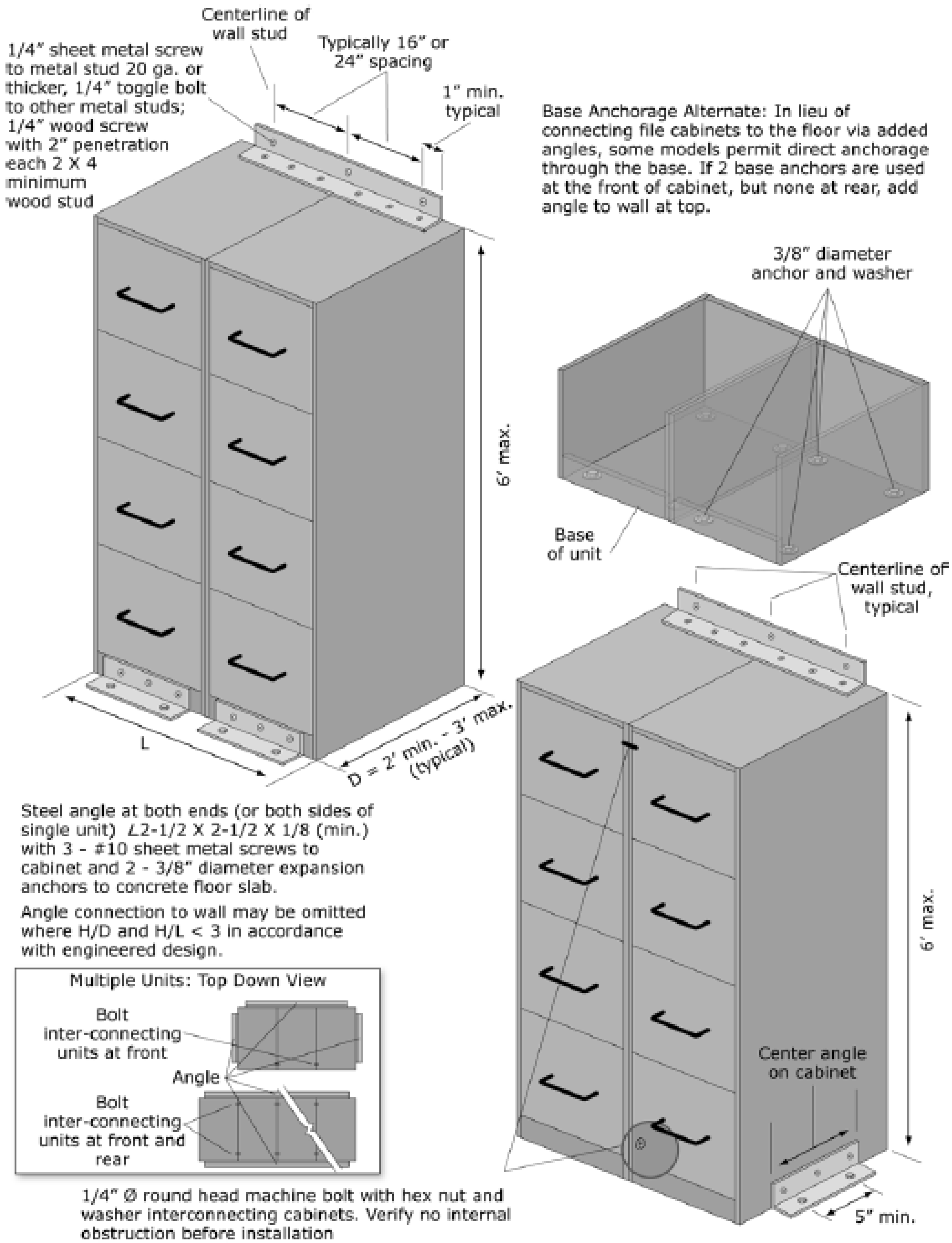


Figure G-21. Wall-mounted File Cabinets.

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)

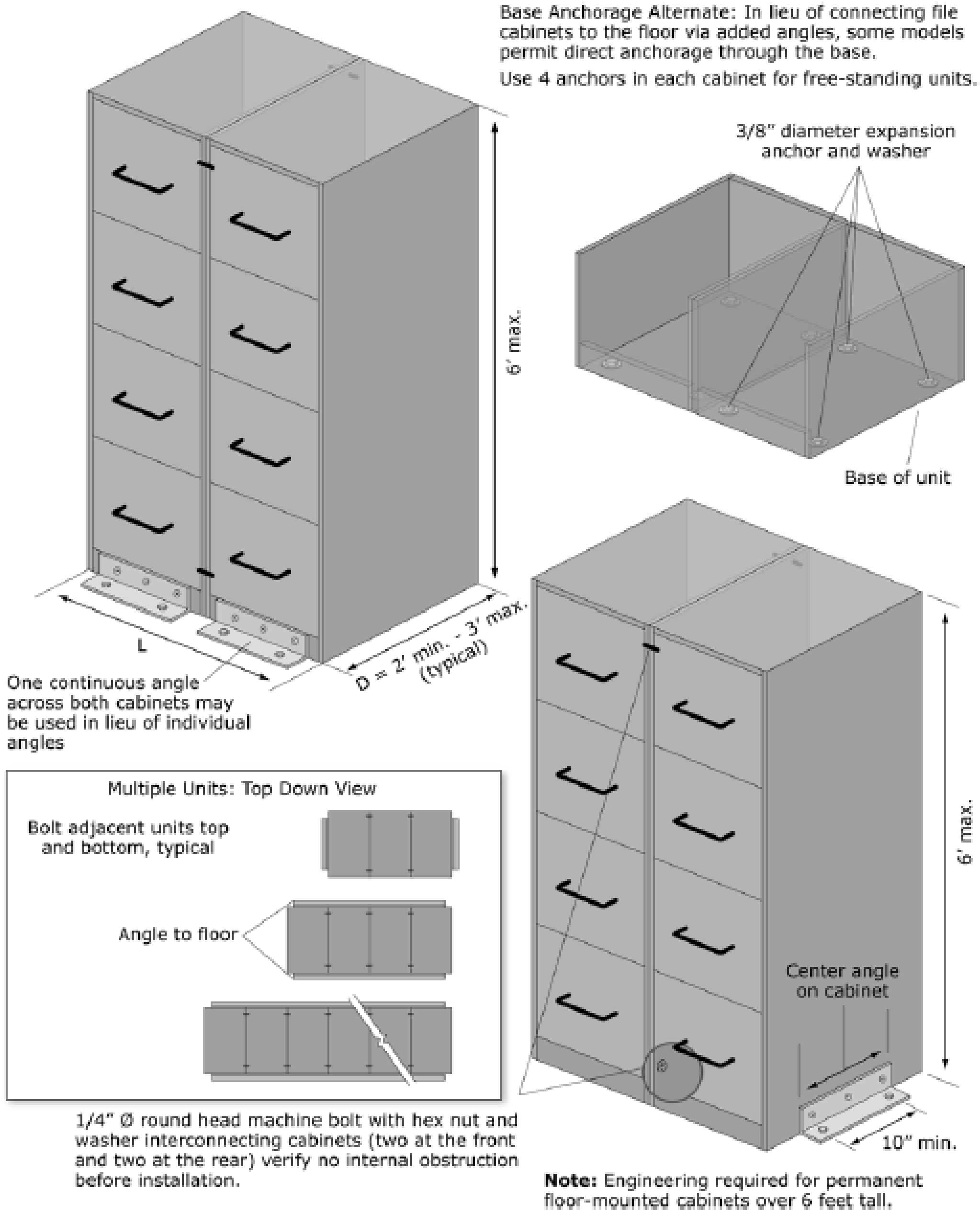


Figure G-22. Base Anchored File Cabinets.

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)

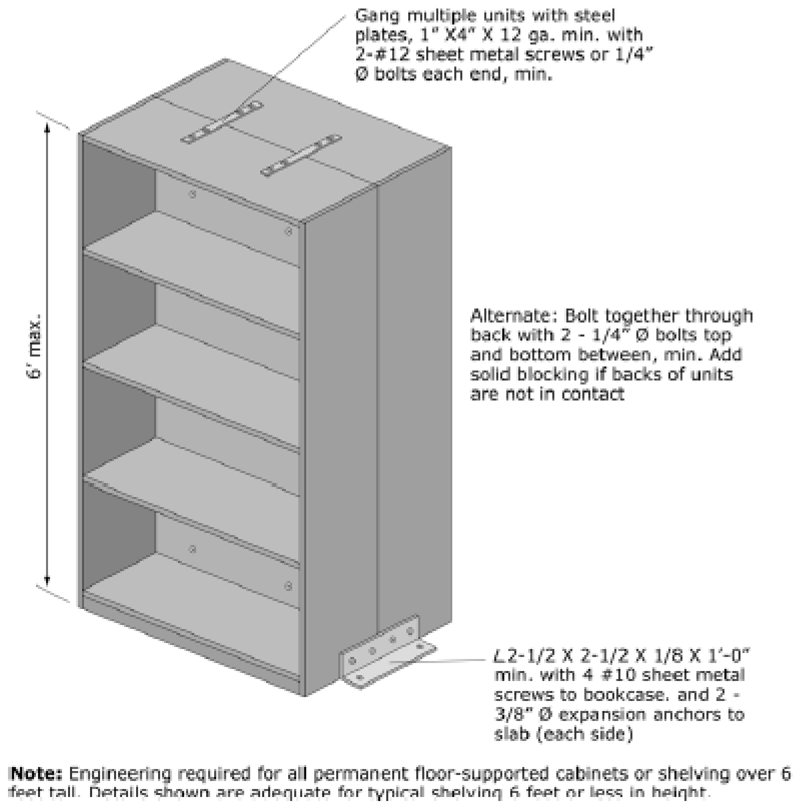


Figure G-23. Anchorage of Freestanding Book Cases Arranged Back to Back.

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)

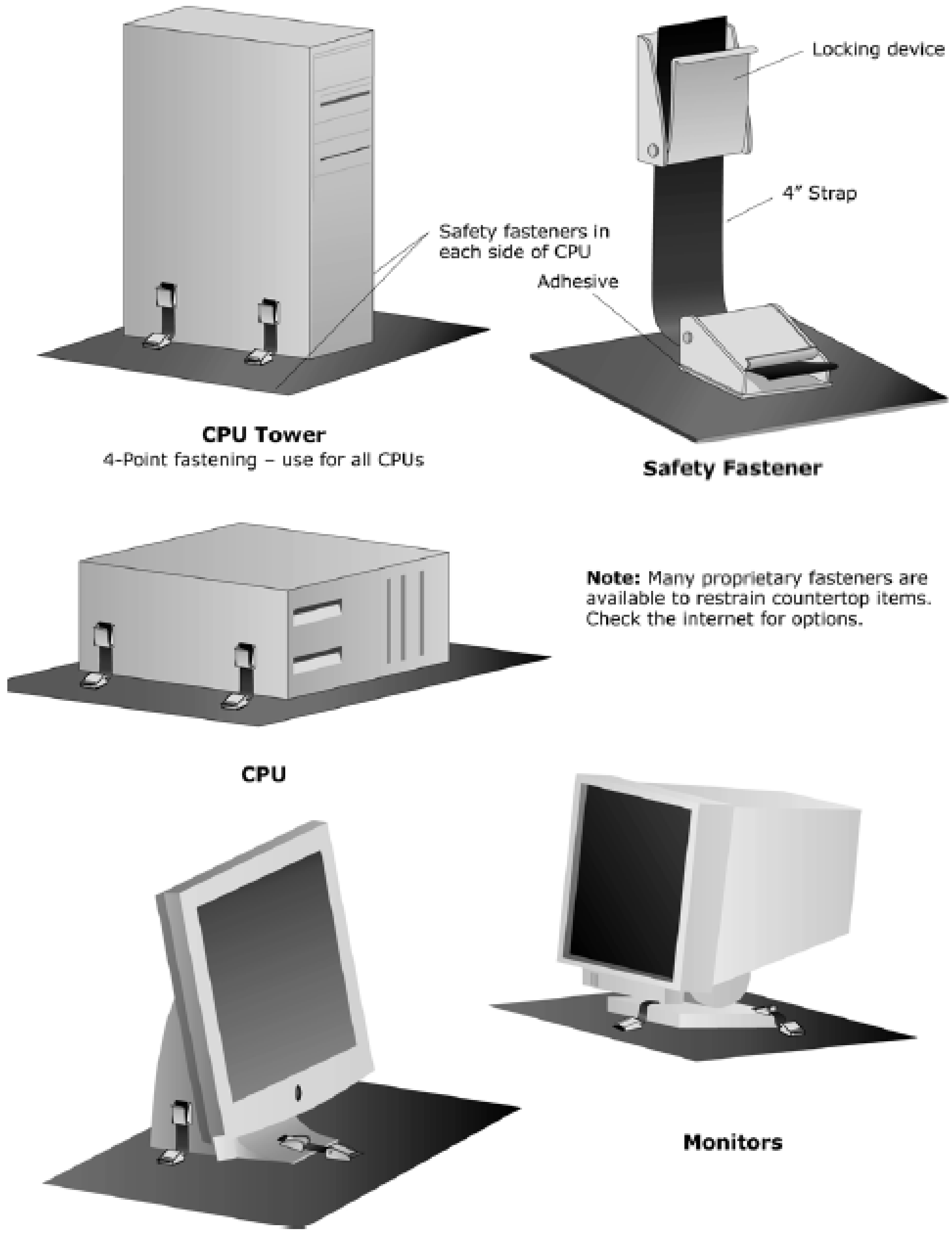
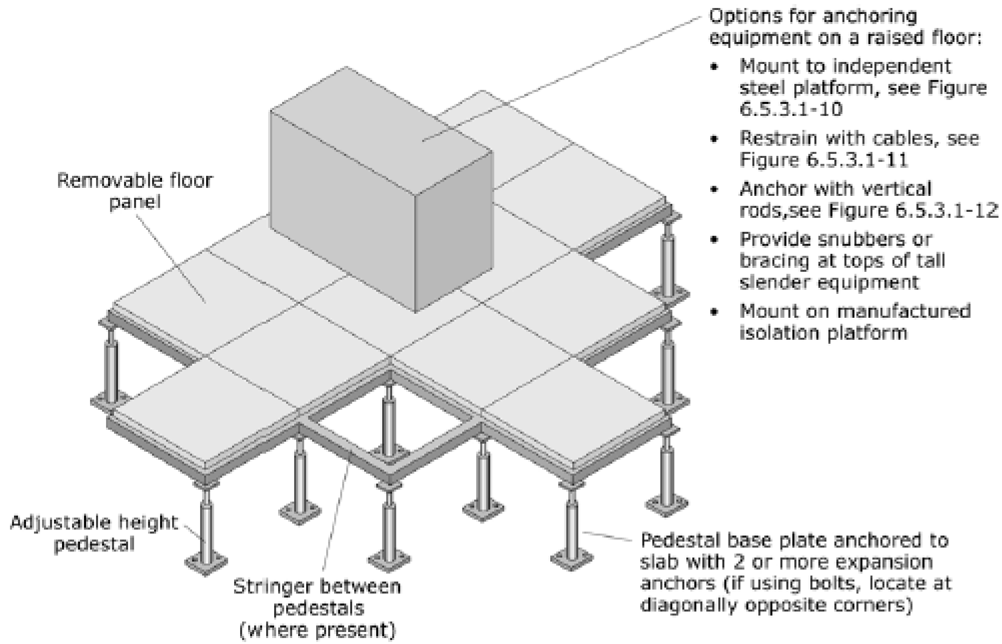
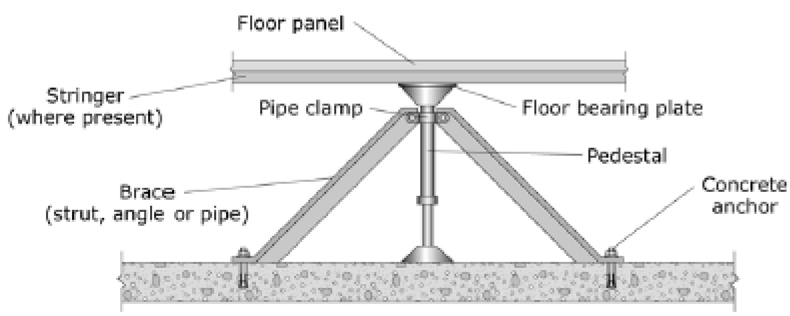


Figure G-24. Desktop Computers and Accessories.

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)



Cantilevered Access Floor Pedestal



Braced Access Floor Pedestal
(use for tall floors or where pedestals are not strong enough to resist seismic forces)

Note: For new floors in areas of high seismicity, purchase and install systems that meet the applicable code provisions for "special access floors."

Figure G-25. Equipment Mounted on Access Floor.

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)

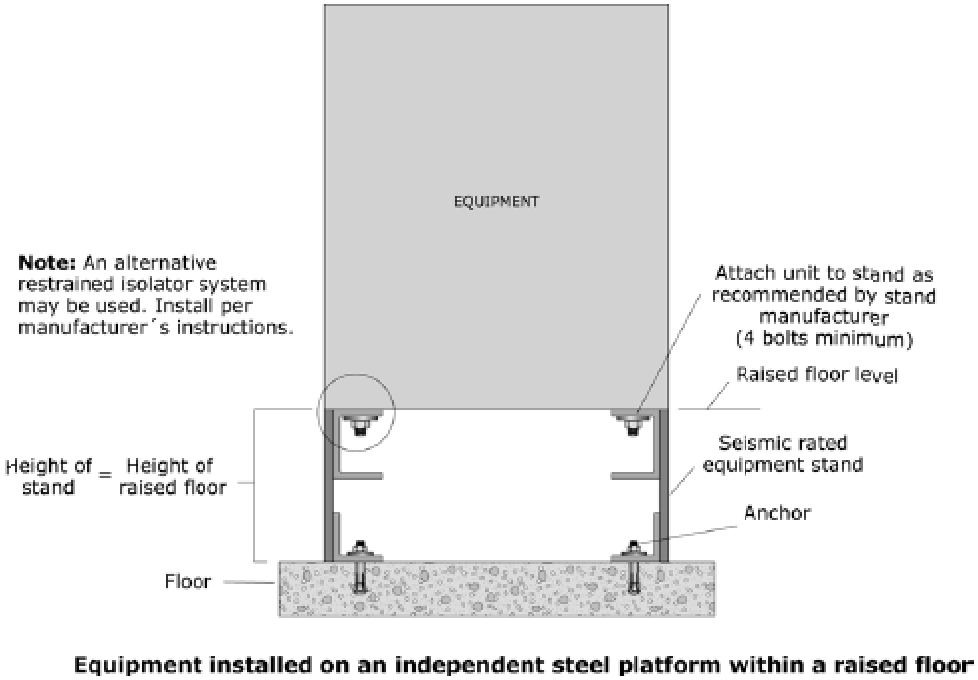


Figure G-26. Equipment Mounted on Access Floor – Independent Base.

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)

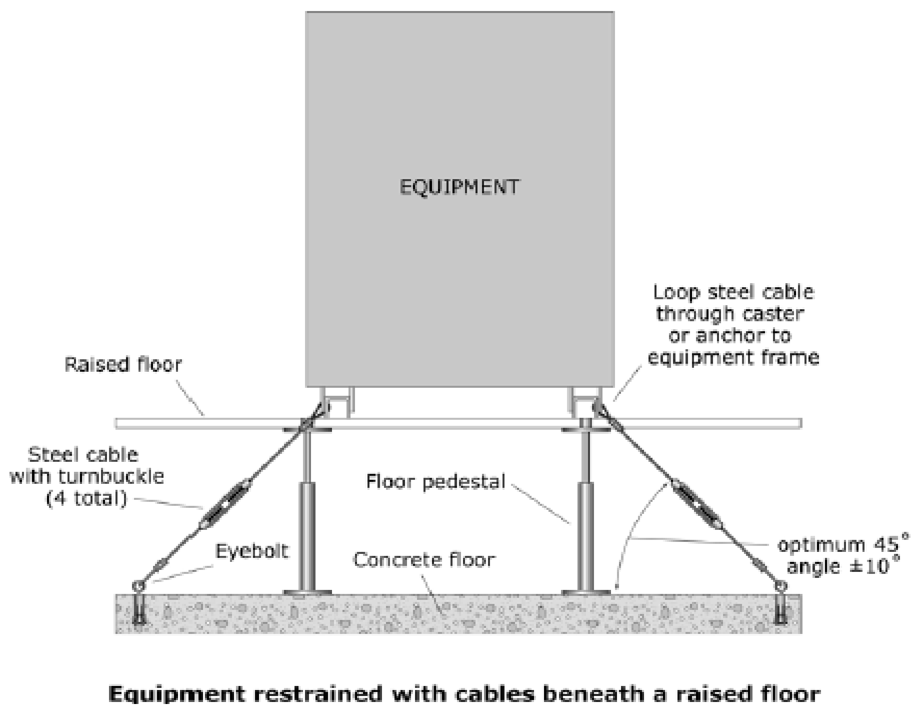


Figure G-27. Equipment Mounted on Access Floor – Cable Braced.

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)

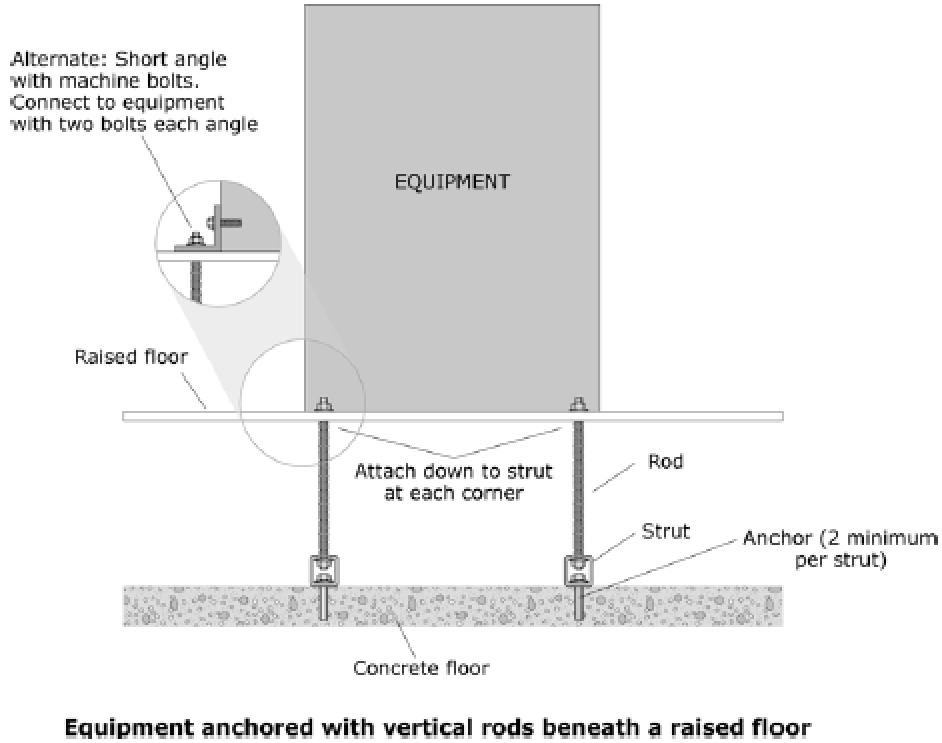
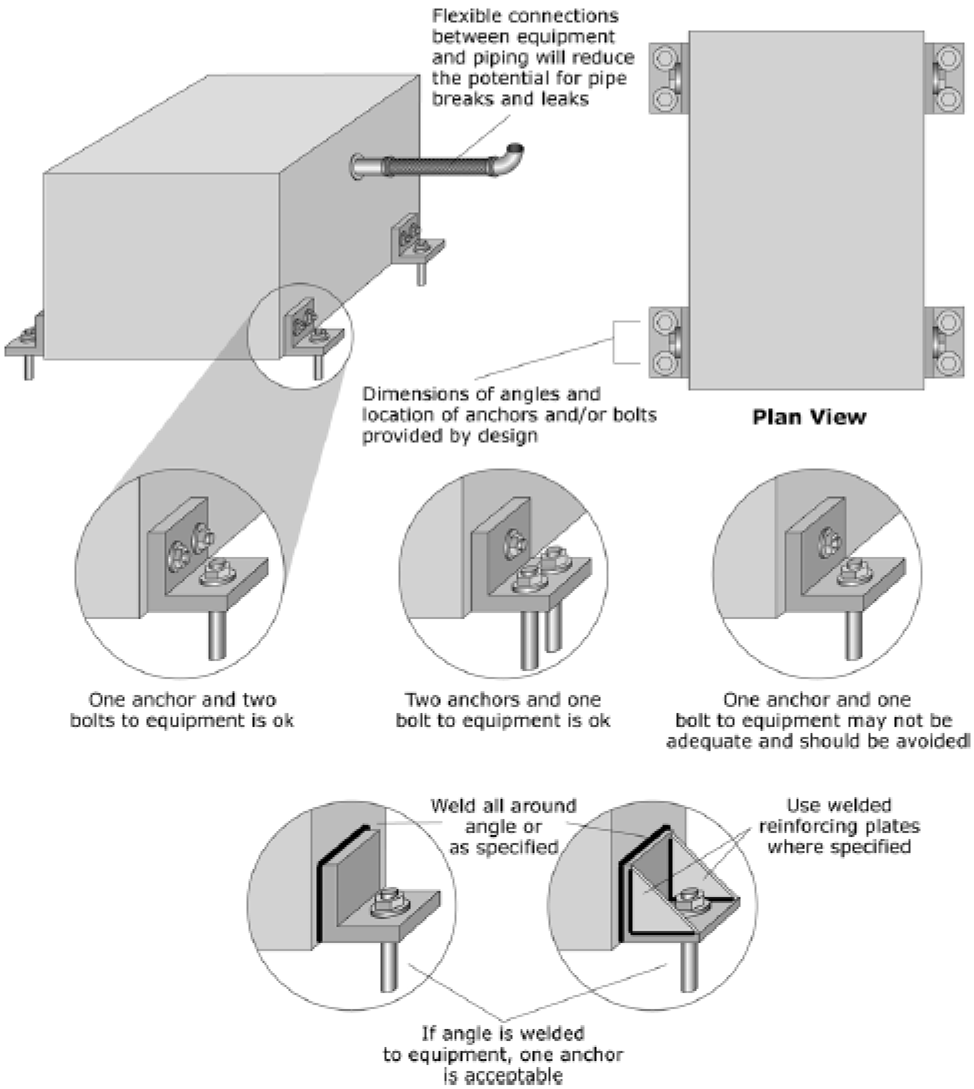


Figure G-28. Equipment Mounted on Access Floor – Tie-down Rods.

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)

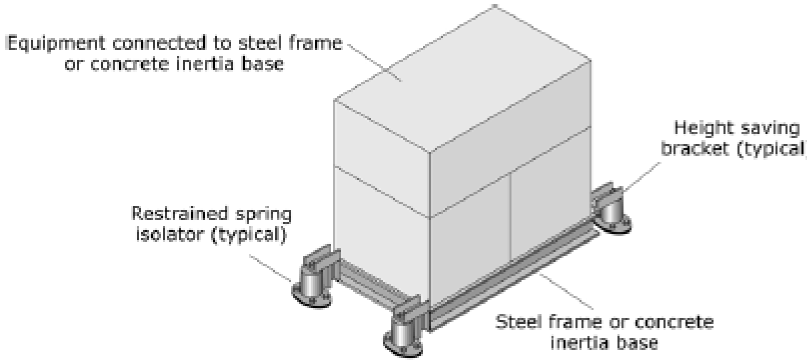
Mechanical and Electrical Equipment



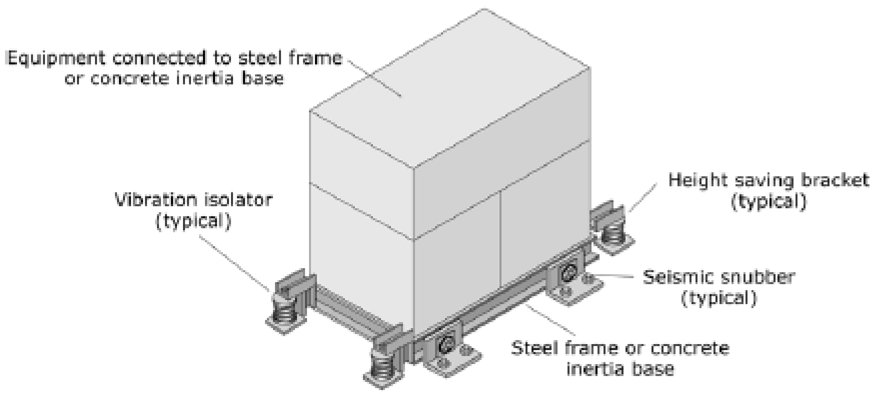
Note: Rigidly mounted equipment shall have flexible connections for the fuel lines and piping.

Figure G-29. Rigidly Floor-mounted Equipment with Added Angles.

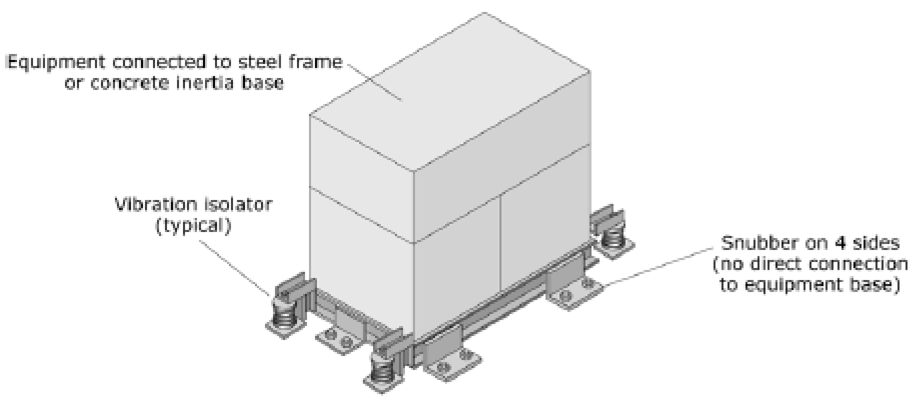
(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)



Supplemental base with restrained spring isolators



Supplemental base with open springs and all-directional snubbers



Supplemental base with open springs and one-directional snubbers

Figure G-30. HVAC Equipment with Vibration Isolation.

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)

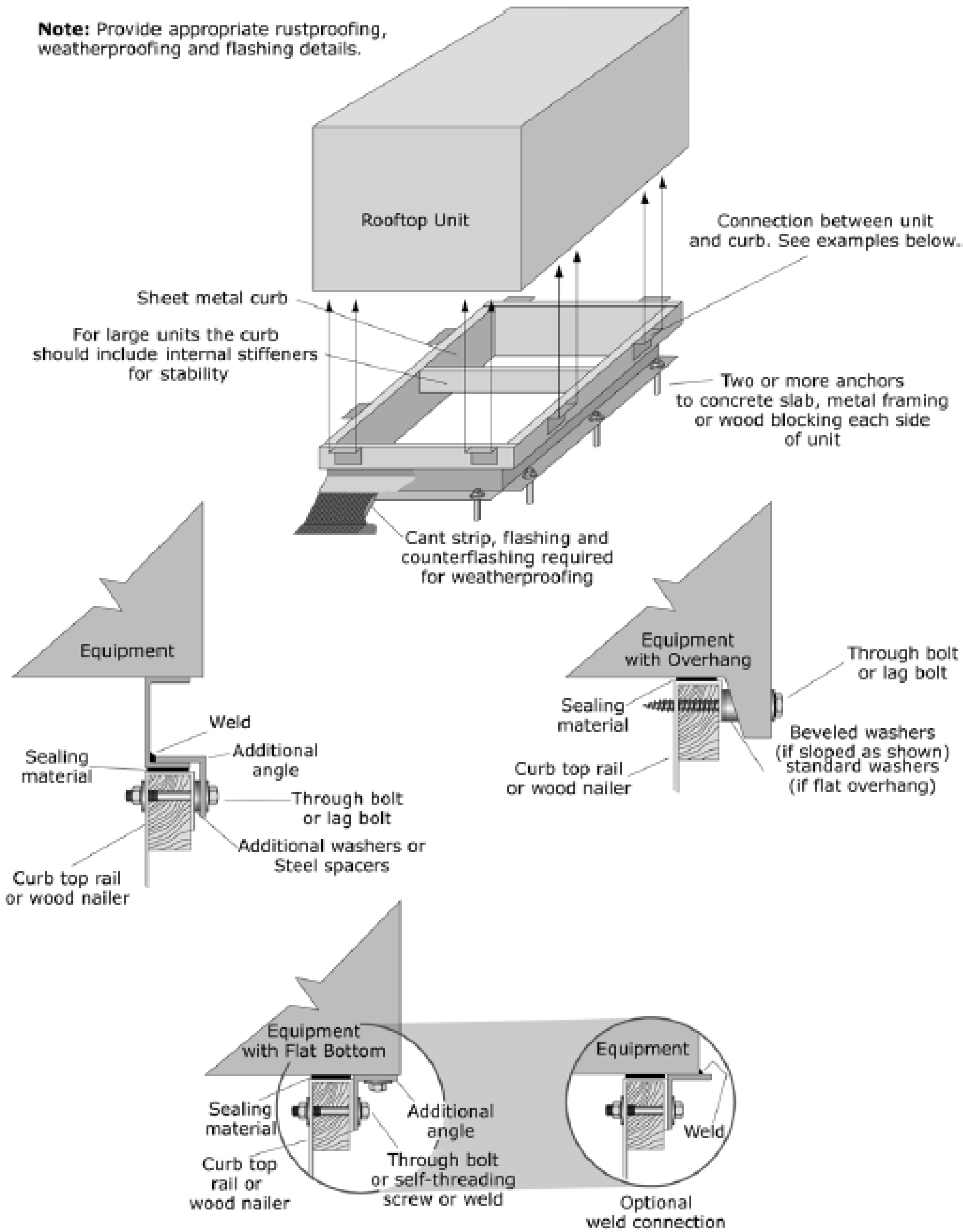


Figure G-31. Rooftop HVAC Equipment.

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)

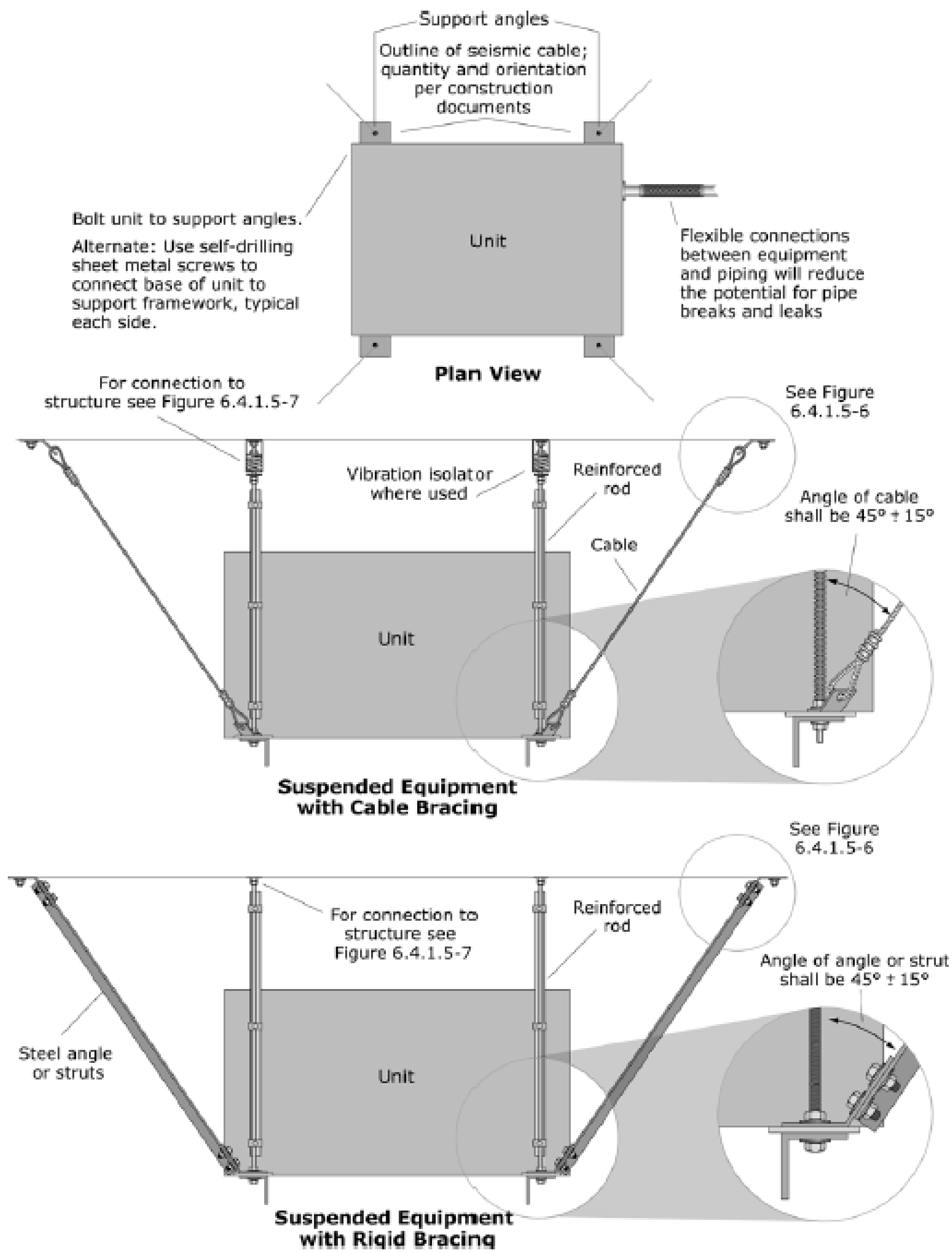


Figure G-32. Suspended Equipment.

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)

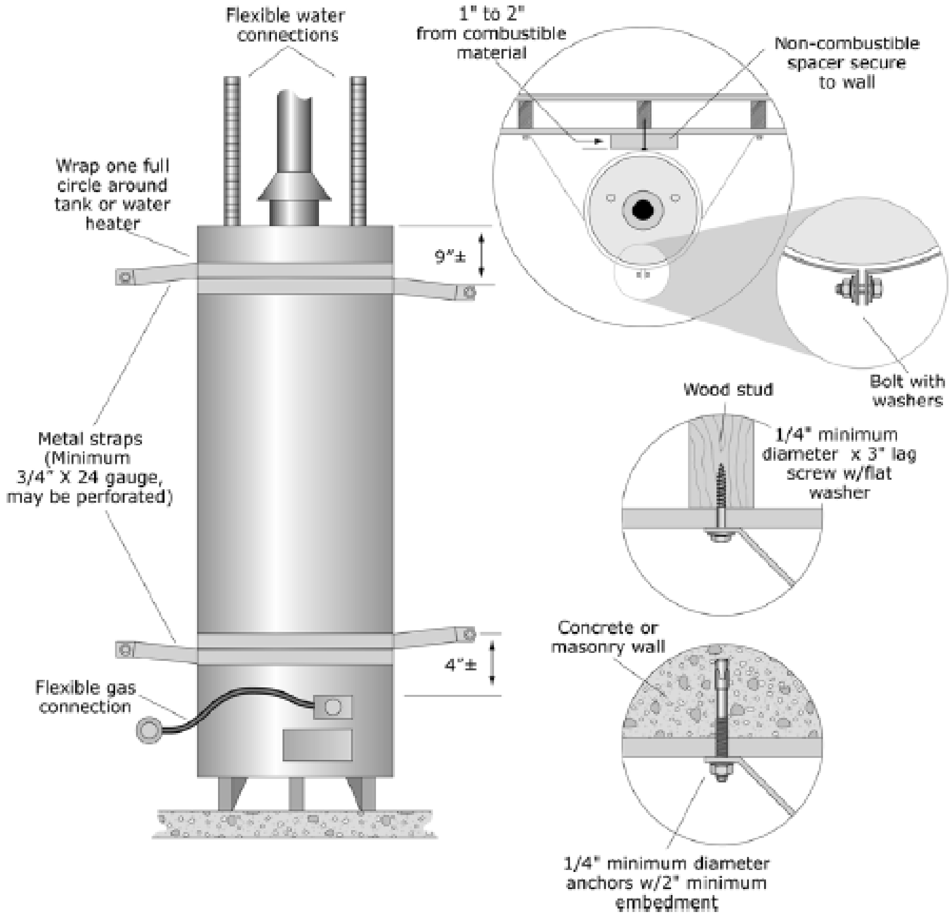


Figure G-33. Water Heater Strapping to Backing Wall.

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)

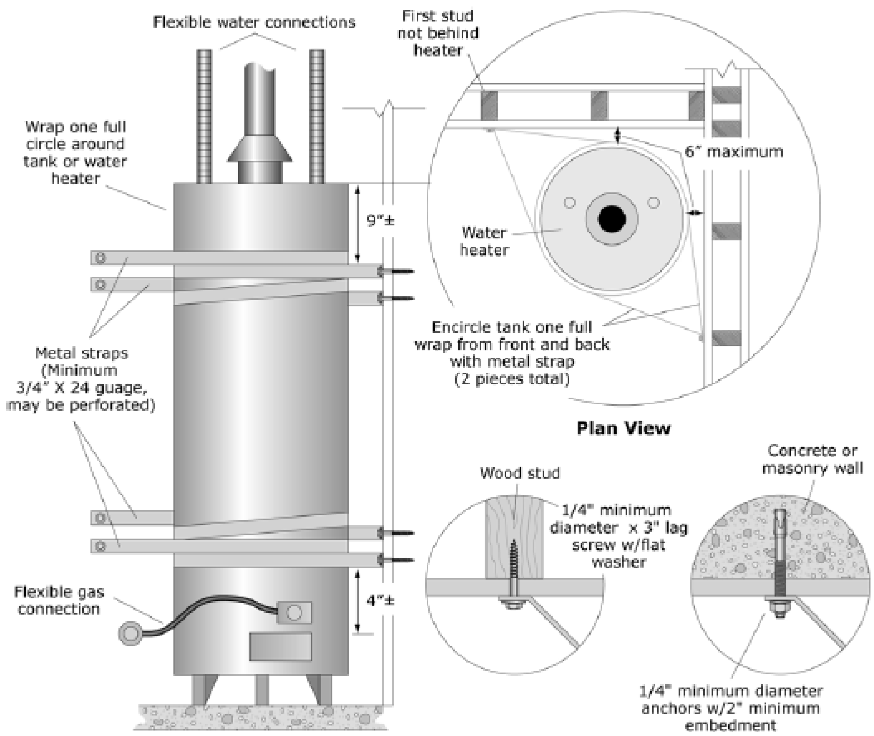


Figure G-34. Water Heater – Strapping at Corner Installation.

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)

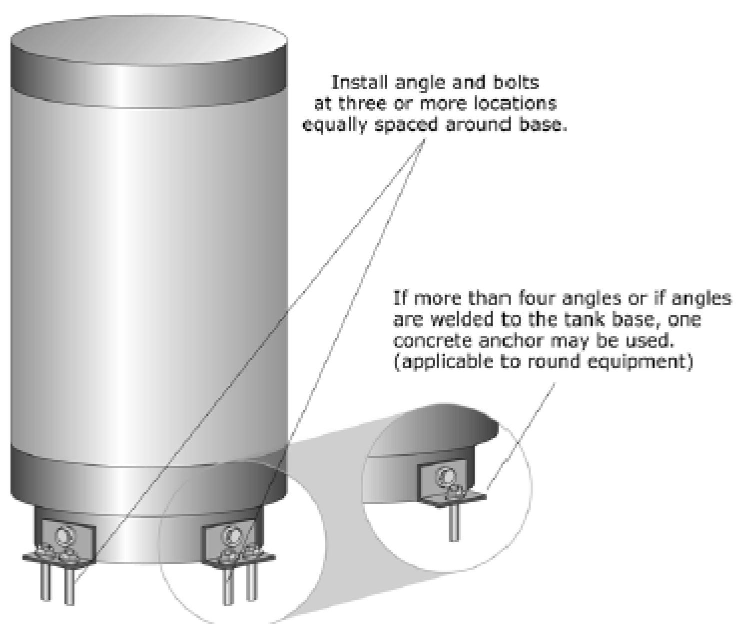


Figure G-35. Water Heater – Base Mounted.

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)

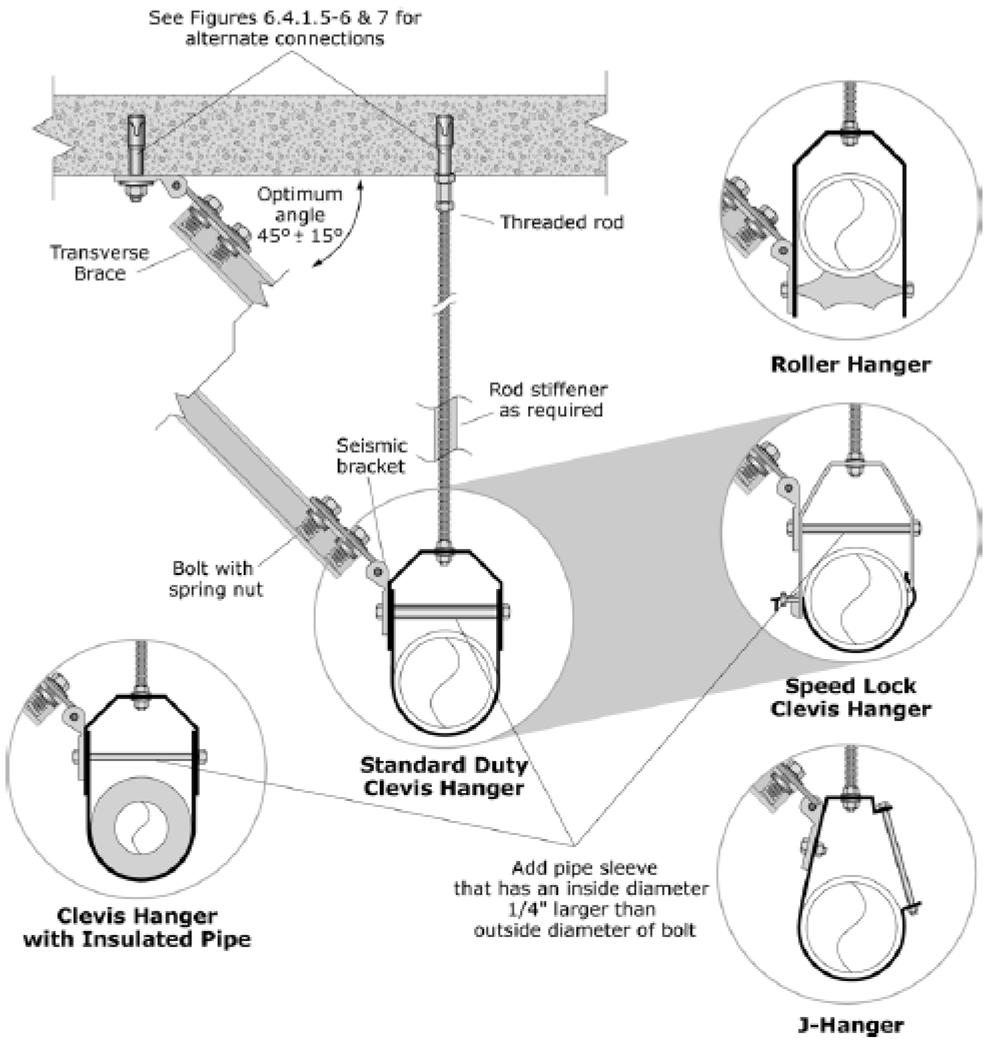


Figure G-36. Rigid Bracing – Single Pipe Transverse.

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)

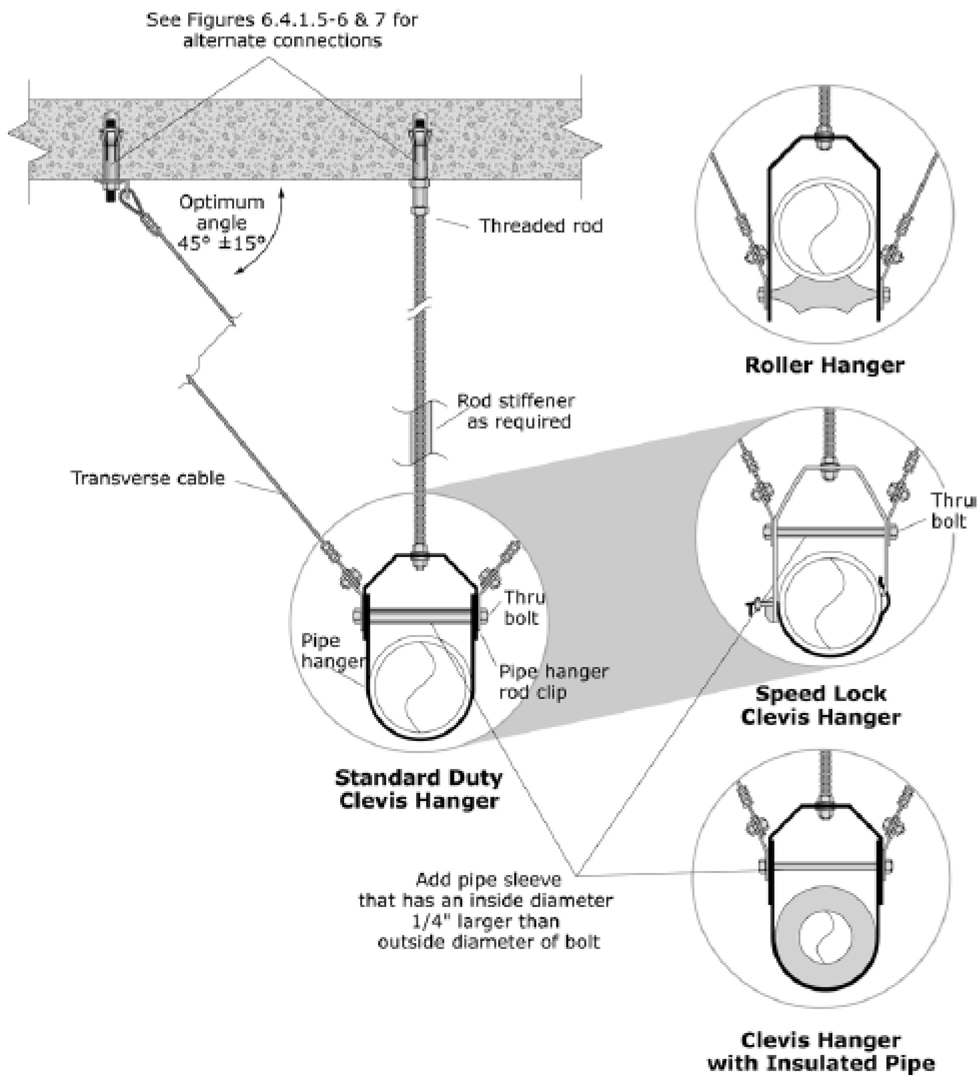


Figure G-37. Cable Bracing – Single Pipe Transverse.

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)

Electrical and Communications

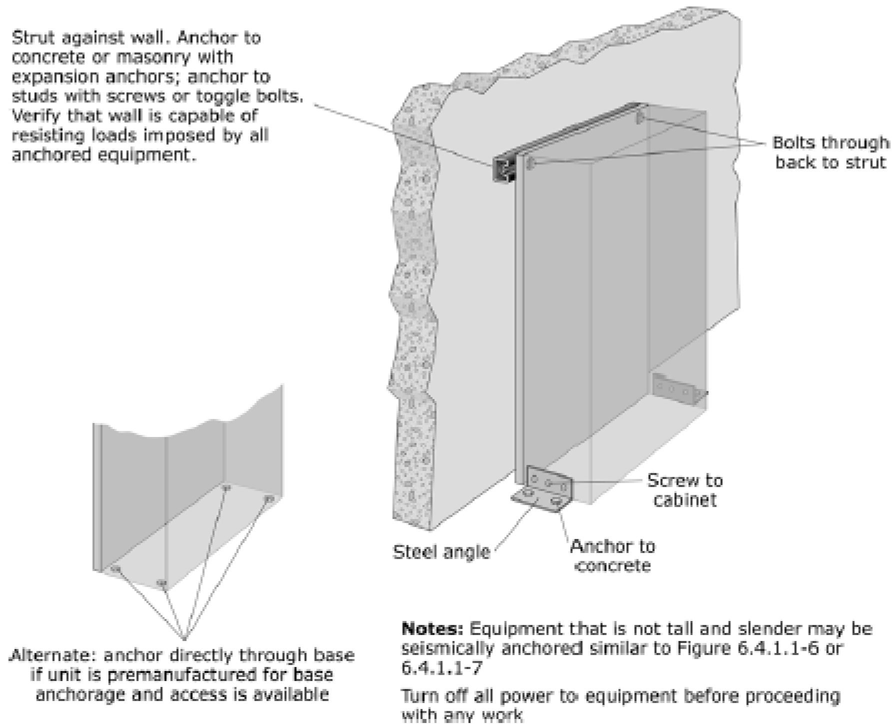


Figure G-38. Electrical Control Panels, Motor Controls Centers, or Switchgear.

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)

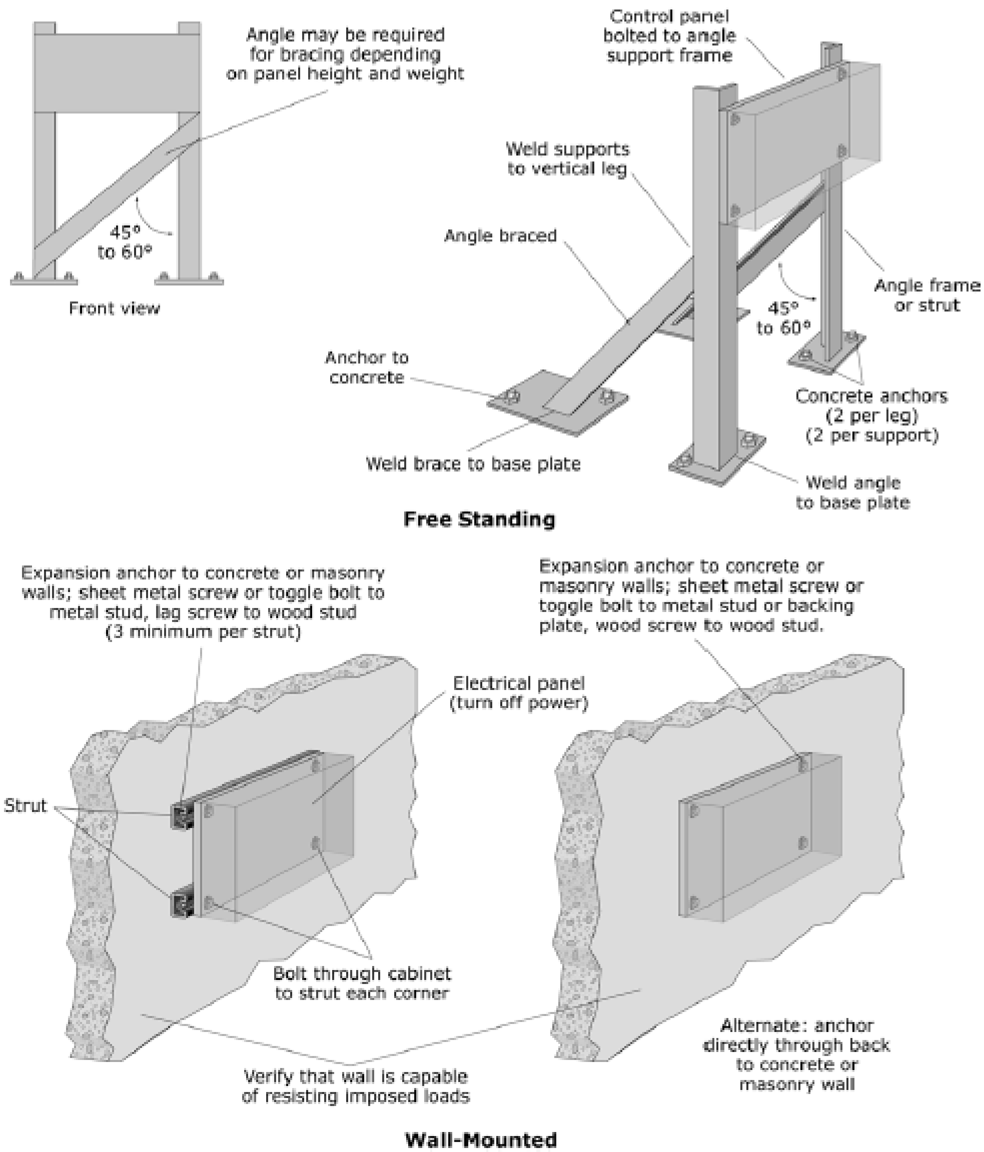


Figure G-39. Freestanding and Wall-mounted Electrical Control Panels, Motor Controls Centers, or Switchgear.
(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)

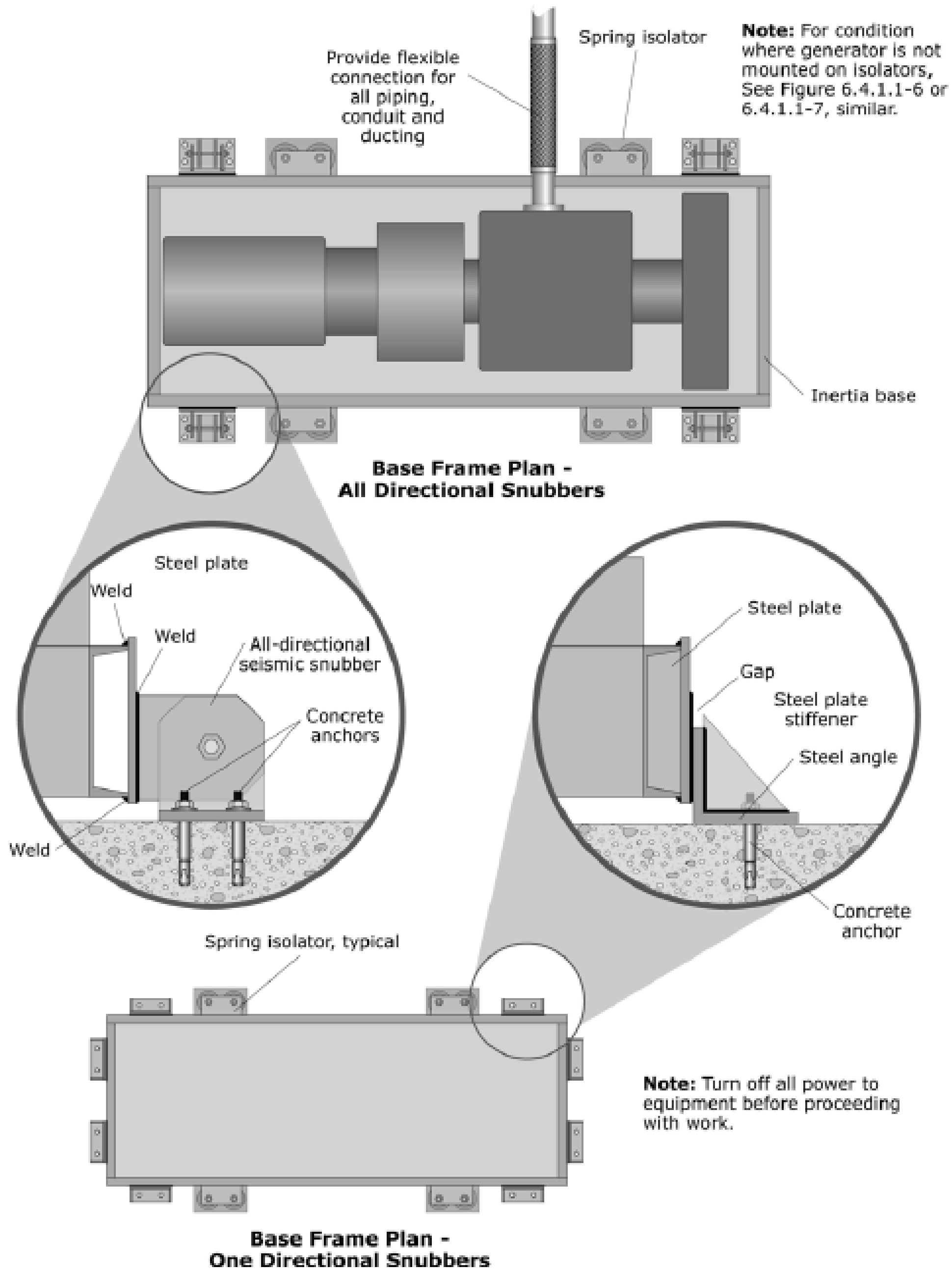


Figure G-40. Emergency Generator.

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)